11-5820-498-35

TM 11-5820-498-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DS,GS, AND DEPOT

MAINTENANCE MANUAL

RADIO SETS

AN/VRC-53, AN/VRC-64, AN/GRC-125

AND AN/GRC-160

AND

AMPLIFIER-POWER SUPPLY GROUPS

OA-3633/GRC AND OA-3633A/GRC

This copy is a reprint which includes current pages from Changes 1 through 4.

HEADQUARTERS, DEPARTMENT OF THE ARMY

DECEMBER 1969

READY

TM 11-5820-498-35
C 4

CHANGE
No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *12 October 1981*

Direct Support, General Support, and Depot Maintenance Manual RADIO SETS AN/VRC-53 (NSN 5820-00-223-7467), AN/VRC-64 (NSN 5820-00-223-7475), AN/GRC-125 (NSN 5820-00-223-7411) AND AN/GRC-160 (NSN 5820-00-223-7473) AND AMPLIFIER-POWER SUPPLY GROUPS OA-3633/GRC AND OA-3633A/GRC (NSN 5820-00-973-3383)

TM 11-5820-498-35, 22 December 1969, is changed as follows:

1. New or changed material is indicated by a bar in the margin.
2. Remove and insert pages as indicated below.

Remove	*Insert*
None	A/(B blank)
1-1 and 1-2	1-1 and 1-2
4-1	4-1
A-1 and A-2	A-1 through A-3

3. File this change sheet in front of the manual for reference purposes.

DISTRIBUTION:

To be distributed in accordance with DA Form 12-51, Direct and General Support Maintenance requirements for AN/VRC-53, 64, AN/GRC-125, 160.

TM 11-5820-498-35
C 3

CHANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *28 April 1981*

Direct Support, General Support, And Depot Maintenance Manual RADIO SETS AN/VRC-53 (NSN 5820-00-223-7467), AN/VRC-64 (NSN 5820-00-223-7475), AN/GRC-125 (NSN 5820-00-223-7411), AND AN/GRC-160 (NSN 5820-00-223-7473), AND AMPLIFIER-POWER SUPPLY GROUPS OA-3633/GRC AND OA-3633A/GRC (NSN 5820-00-973-3383)

TM 11-5820-498-35, 22 December 1969, is changed as follows:

1. Title of the manual is changed as indicated above.
2. This change covers OA-3633A/GRC, procured on Contract DAAB07-79-C-0068 (para 1-4*a*(1)).
3. New or changed material is indicated by a bar in the margin.
4. Remove and insert pages as indicated below:

Remove pages	*Insert pages*
1-1 and 1-2	1-1 and 1-2
3-17 and 3-18	3-17 through 3-18.1
Figure 4-9	Figure 4-9

5. File this change sheet in the front of the manual for reference purposes.

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-51 Direct and General Support maintenance requirements for AN/VRC-53, AN/VRC-64, AN/GRC-125, AN/GRC-160.

WARNING

Remove the battery from the radio sets when the radio sets are not being used. This is required to prevent Hydrogen gas (a by-product of Magnesium Battery, BA-4386/U discharge action) from accumulating. Personnel may be injured and equipment damaged if the gas explodes.

You can tell the difference between Magnesium Battery, BA-4386/U, and Lithium Battery, BA-5598/U, by looking at their size. The lithium battery is half the size of (smaller than) the magnesium battery. Both the magnesium and lithium batteries are disposed of in a sanitary landfill.

WARNING

A lithium battery is used in this equipment, and is potentially hazardous if misused or tampered with before, during, and after discharge. The following precautions must be strictly observed to prevent possible injury to personnel or damage to equipment.

DO NOT heat, incinerate, crush, puncture, disassemble, or otherwise mutilate the batteries.

DO NOT short circuit.

DO NOT recharge.

DO NOT bypass internal fuse or replace with a fuse of a different rating. Replacement fuses are packed two per every ten batteries.

DO NOT store in equipment during long periods of unuse in excess of 30 days.

TURN OFF the equipment immediately if you detect the battery compartment becoming unduly hot or rapidly increasing in temperature, hear battery venting (hissing sound), or smell irritating sulfur dioxide gas. Remove and dispose of the battery only after it is cool (30-60 minutes).

DO NOT use carbon dioxide extinguishers on exposed lithium fuel fires. Flood the burning material with water or use graphite type compounds or extinguishers to extinguish burning lithium.

TECHNICAL MANUAL
O. 11-5820-498-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *22 December 1969*

DS, GS, and Depot Maintenance Manual

RADIO SETS AN/VRC-53, AN/VRC-64, AN/GRC-125 AND AN/GRC-160, AND AMPLIFIER-POWER SUPPLY GROUPS OA-3633/GRC AND OA-3633A/GRC

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*This manual supersedes TM 11-5820-498-35, 7 February 1963, including all changes.

d. For applicable forms and records, refer to TM 11-5820-498-12.

e. For OA-3633(*)/GRC and AM-2060(*)/GRC differences, and for differences in equipment and radio configurations, refer to paragraph 1-4. (AM-2060(*)/GRC represents AM-2060/GRC and AM-2060A/GRC.)

1-2. Index of Publications

DA Pam 310-4. Refer to latest issue of DA Pam 310-4 to determine whether there are new editions, changes, additional publications or modification work orders pertaining to the equipment.

1-3. Maintenance Forms, Records and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (Army). Air Force personnel will use AFM 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF-364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73/AFR 400-54/MCO 4430.3E.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF-361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR75-18-/MCOP4610.19C/DLAR 4500.15.

1-3.1. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. In either case, a reply will be furnished direct to you.

1-3.2. Reporting Equipment Improvement Recommendations (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Tell us why a procedure is hard to perform. Put it on an SF-368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. We'll send a reply.

1-3.3. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750 -244-2.

1-3.4. Administrative Storage

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraph 1-3.3, TM 11-5820-498-12.

1-4. Differences in Equipment and Configurations

a. The OA-3633/GRC includes Cable Assembly, Special Purpose, Electrical CX-4655/GRC (7 or 11 inches long) (fig. 3-5) and Amplifier-Power Supply AM-2060/GRC. The OA-3633A/GRC includes the CX-4655/GRC and AM-2060A/GRC.

(1) The AM-2060A/GRC is the same as the AM-2060/GRC except that the A model has added two filter capacitors C8 and C9 to the 25-5-volt dc input at connector J3 (fig. 4-9) and the use of a rubber boot for the front panel SPKR switch (fig. 3-16). However, on equipment identified under Contract No. DAAB 07-79-C-0068, capacitor C8 was eliminated and diode CR1, 1N4720 was placed in parallel with C9 (see note 12 in figure 4-9).

(2) Throughout this manual, AM-2060(*)/GRC applies to AM-2060/GRC and AM-2060A/GRC unless a particular model is specified.

b. The OA-3633/GRC is used with the RT-505/PRC-25 (TM 11-5820-398-35) in the AN/VRC-53 and AN/GRC-125 radio configurations; and with the RT-841/PRC-77 (TM 11-5820-667-35) in the AN/VRC-64 and AN/GRC-160 radio configurations. All references to a receiver-transmitter in this manual apply to the RT-505/PRC-25 and RT-841/PRC-77 unless one is specifically mentioned.

c. The OA-3633(*)/GRC can be used with Antenna Matching Unit MX-2799/VRC (part of Antenna AT-912/VRC (TM 11-5820-401-35) which is used in the AN/VRC-53 and AN/GRC-125 configurations), AT-912/VRC-53 and AN/GRC-125 configurations), and with Matching Unit-Base MX-6707/VRC ((TM 11-5985-262-15) which is used in the AN/VRC-64 and AN/GRC-160 configurations). All references in this manual to antenna matching unit apply to the MX-2799/VRC and MX-6707/VRC, unless one is specifically mentioned.

CHAPTER 2

CIRCUIT FUNCTIONING

Section I. RADIO, AND RADIO WITH INTERCOM, CIRCUIT FUNCTIONING

2–1. General

a. The radio sets include a receiver-transmitter (RT–505/PRC–25 or RT–841/PRC–77), a whip antenna (AT–912/VRC or AS–1729/VRC), the MT–1029/VRC, and OA–3633(*)/GRC. An audio accessory, interconnecting cables, and mounting hardware to mount the radio sets in a vehicle are provided in the installation unit (kit) applicable to the radio set installation (SB 11–131).

b. The OA–3633(*)/GRC converts the nominal 24-volt vehicular battery to operating voltages (13, 2.6, and 3 volts dc) for itself and the receiver-transmitter. It also has provision for listening on a loudspeaker to the signals received on e receiver-transmitter, and for matching the utput of the receiver-transmitter to the whip antenna matching network.

c. The radio sets are also capable of operating with a vehicular radio-intercommunication (intercom system. The intercom system includes a central audio and power control (Amplifier, Audio Frequency AM–1780/VRC), and crewmember control boxes (Controls, Intercommunication Set C–2296/VRC (located on the rear outside the vehicle), C–2297/VRC (for vehicle driver), and C–2298/VRC (for other crewmembers)). The radio-intercome boxes, interconnecting cables, mounting hardware, and audio accessories required for the radio set with an intercom system are provided in the installation kit applicable to the vehicle in which the equipment is used (SB 11–131). The crewmembers can talk either on the intercom system or over the receiver-transmitter in the radio set.

d. The internal circuit functioning of the re- ver-transmitters, whip antennas, and AT–1029/VRC as well as the intercom system control boxes is provided in the manual associated with the particular equipment. Refer to paragraph 1–1*b* and *c* for the associated publications.

e. The module circuits in the RT–505/PRC–25 are functionally the same as those in the RT–841/PRC–77. Those that are identical in both receiver-transmitters have the same reference designation (*for example:* dc to dc converter A10 and speech amplifier limiter A22). Those modules that are functionally identical but have internal circuit differences are identified with different reference designations. *For example:* squelch relay control A24 and receiver audio amplifier A25 in the RT–505/PRC–25 are the same, as squelch relay control A54 and receiver audio amplifier A55 in the RT–841/PRC–77. In this manual those functionally similar modules are identified thusly: A24/A54, A25/A55, A22/A22, etc.

2–2. Radio and OA–3633(*)/GRC, Circuit Functioning Without Crewmember Control Boxes

(fig. 4–3)

When the radio configuration does not include crewmember control boxes, the radio and OA–3633/(*)GRC circuit functioning are given in *a* through *d* below. Figure 4–3 shows the circuits in radio standby mode; that is, neither transmitting or receiving a radio signal.

a. Circuit Setup. For this radio configuration, the following conditions are required:

(1) The link in the MT–1029/VRC must be set for local control of the dc power to the equipment.

(2) On the AM–2060(*)/GRC, the POWER circuit breaker switch is set to ON, and the ANT. FREQ. CONTROL switch is set to a position that includes the frequency at which the receiver-transmitter is tuned. The SPKR switch is set to ON.

(3) On the receiver-transmitter, the function switch S1 is set to ON, and the frequency selector switches MC and KC (not shown in fig. 4–3) are set to the desired operating frequency. An audio accessory (such as the H–189/GR, H–161/U, or equal) is connected to one of the receiver-transmitter AUDIO receptacles FL1 or FL2.

b. Power Distribution.

(1) Power from the battery source is applied through the MT-1029/VRC and the AM-2060(*)/GRC PWR switch CB1 to audio amplifiers Q1 and Q2, and to regulator amplifiers Q3 and Q4. The dc power is also applied through ANT. FREQ. CONTROL switch S2 to the control circuits of the antenna matching unit (MX-2799/VRC or MX-6707/VRC).

(2) From the AM-2060(*)/GRC, the dc operating voltages are applied to the receiver-transmitter: 13 volts for both receiver-transmitters (RT-505/PRC-25 and RT-841/PRC-77), and 3 and 2.6 volts for the RT-505/PRC-25 only.

c. Radio Transmission. When the push-to-talk switch in the audio accessory is operated to *radio* position, the following circuit operations occur.

(1) The audio accessory push-to-talk switch provides a ground through receiver-transmitter relays K1 and K2 for the 13 volts supplied by Q3 and Q4 in the AM-2060(*)/GRC.

(2) In the AM-2060(*)/GRC, K1 also operates and disconnects the loudspeaker from the audio circuit.

(3) In the receiver-transmitter, the following actions occur:

(*a*) Relay K3 remains unoperated, Relays K1 and K2 operate to apply power to the transmitter circuits of the receiver-transmitter. In the RT-505/PRC-25, K2 applies power to the filament of the power amplifier V1.

NOTE

Relay K1 in the AM-2060(*)/GRC also operates and disconnects the loudspeaker from the output of Q1 and Q2. This operation prevents sound feedback between the loudspeaker and the audio accessory microphone.

(*b*) Speech signals from the audio accessory now applied through speech amplifier A22, transmitting amplifier, and the power amplifier (P.A.) stages to the antenna for transmission to the distant radio station.

(*c*) Sidetone of the speech amplifier is applied from speech amplifier A22 through receiver audio amplifier A25/A55 to the audio accessory earphones.

d. Radio Reception. For radio reception, the push-to-talk switch of the audio accessory is unoperated. The following circuit operations occur when a signal is received from the distant radio station. Receiver-transmitter relays K1, K2, and K3, and the AM-2060(*)/GRC relay K1 is unoperated.

(1) *Receiver-transmitter function switch set to ON.*

(*a*) A signal received at the antenna is applied through the RF-IF amplifiers and discriminator circuits to receiver audio amplifier A25/A55.

(*b*) From the A25/A55, the speech signal are applied as follows:

1. To the audio accessory earphone.

2. Through AM-2060(*)/GRC audio amplifiers Q1 and Q2 to the loudspeaker.

(2) *Receiver-transmitter function switch set to SQUELCH.* When the function switch is set to SQUELCH, signals received at the antenna must contain a 150-Hz squelch tone. Until the 150-Hz tone is received, receiver-transmitter relay K3 is unoperated. Relay K3 provides a short circuit to ground through K3 contacts and function switch S1 for the output transformer in A25/A55. Thus, the FM rushing noise is not heard in the audio accessory earphones or the loudspeaker.

(*a*) Signals received at the antenna are applied through the RF-IF amplifiers and the discriminator circuits to receiver audio amplifier A25/A55.

(*b*) From the discriminator, the 150-H squelch signal is applied to squelch relay contr A24/A54.

(*c*) A24/A54 then provides a closed circuit to operate relay K3. When K3 operates, it removes the short from the output transformer in A25/A55.

(*d*) Speech signals are now applied from the output transformer in A25/A55 to the audio accessory earphones. The speech signal is also applied through the AM-2060(*)/GRC audio amplifier Q1 and Q2 to the loudspeaker.

2-3. System Power Distribution, Including Crew-member Control Boxes (fig. 4-4)

The distribution of power to operate the radio, AM-2060(*)/GRC, and the crewmember control boxes is controlled from the AM-1780/VRC. Whenever the intercom equipment is connected to the radio and the intercom system, the link in the MT-1029/GRC must be connected for remo power control operation as shown in figure 4-4. The setting of the AM-1780/VRC MAIN PWR switch determines the path of the power distribution from the MT-1029/VRC. The charts in *a* and *b* below trace the distribution of power through-

out the radio and crewmember control boxes in system.

a. AM-1780/VRC MAIN PWR Switch at NORM Position.

(1) Power distribution to OA-3633/GRC, receiver-transmitter, and MX-2799/VRC or MX-6707/VRC.

Unit	From	To
T-1029/VRC	J21, pin B	J22, pin B
-4723/VRC	Pin B	Pin B
AM-1780/VRC	J501, pin B	Switch S504, rear (NORM position)
	Switch S504, rear	J501, pin D
CX-4723/VRC	Pin D	Pin D
MT-1029/VRC	J22, pin D	J24, pin J
AM-2060(*)/GRC	J3, pins J and C*	Switch S2, front and rear
	Switch S2	J4 (pins used depend on setting of S2)
	J3, pins J and C*	Q1, Q2, Q3, and Q4, and R17
	Q1 and Q2	J2, pin B
	Q3 and Q4	J2, pins E and M
	R17	J2, pin H
	K1	J2, pins N and C
Receiver-transmitter	J3, pin B	FL1 or FL2, pin B; to audio accessory earphone
	J3, pin A	Chassis ground
	J3, pin M	A10, only in RT-505/PRC-15
	J3, pin H	V1 filament in RT-505/PRC-25 only when K2 is operated by closure of audio accessory push-to-talk switch
	J3, pin N	K1 and K2
	J3, pin C	K1 and K2 to audio accessory push-to-talk switch. Switch operation will key K1 and K2 to set up receiver-transmitter in transmit mode
CX-4722/VRC	Pins used depend on setting of S2	Pins used depend on setting of S2
MX-2799/VRC or MX-6707/VRC	J551; pins used depend on setting of S2.	Pins used depend on setting of S2

* Indicates parallel connections from J3, with CB1 in ON position.

(2) Power distribution through AM-1780 /VRC and crewmember control boxes.

Unit	From	To
MT-1029/VRC	J21, pin B	J22, pin B
CX-4723/VRC	Pin B	Pin B
AM-1780/VRC	J501, pin B	S504, rear
	S504, rear	J501, pin D
CX-4723/VRC	Pin D	Pin D
MT-1029/VRC	J22, pin D	J24, pin D
AM-2060(*)/GRC	J3, pin J	J3, pin C through CB1
MT-1029/VRC	J24, pin C	J22, pin C
CX-4723/VRC	Pin C	Pin C
AM-1780/VRC	J501, pin C	S504, pin C
	S504, front	CB501
	CB501*	J504, pin C
-4723/VRC	Pin C	Pin C
C-2298/VRC	J801, pin C	Amplifier A80
AM-1780/VRC	CB501*	J505 (J506, J507), pin C
CX-4723/VRC	Pin C	Pin C
2297/VRC	J904, pin C*	Amplifier A80
	J904, pin C*	S901, rear (EXT position)
	S901, rear	J901, pin C

See footnote at end of table.

Unit	From	To
Cable (fig. 4-5, note 9)	Pin C	Pin C
C-2296/VRC	J61, pin C	Amplifier A80

[a] Indicates parallel connection from CB501.
[b] Indicates parallel connection from J904, pin C.

b. AM-1780/VRC MAIN PWR Switch at INT ONLY. Under this arrangement, the radio circuit is inoperative, and only the intercom circuit is operative.

Unit	From	To
MT-1029/VRC	J21, pin B	J22, pin B
CX-4723/VRC	Pin B	Pin B
AM-1780/VRC	J501, pin B	S504, front
	S504, front	CB501
	CB501[a]	Interphone amplifier A520
	CB501[a]	J504, pin C
CX-4723/VRC	Pin C	Pin C
C-2298/VRC	J801, pin C	Amplifier A80
AM-1780/VRC	CB501[a]	J505 (J506, J507) pin C
CX-4723/VRC	Pin C	Pin C
C-2297/VRC	J904, pin C[b]	Amplifier A80
	J904, pin C[b]	S901, rear (EXT position)
	S901, rear	J901, pin C
Cable (fig. 4-4, note 9)	Pin C	Pin C
C-2296/VRC	J61, pin C	Amplifier A80

[a] Indicates parallel connection from CB501.
[b] Indicates parallel connection from J904, pin C.

2-4. Receiver-Transmitter Control of Radio Transmission and Microphone Signal Distribution, Including Crewmember Control Boxes (fig. 4-5)

The crewmember control boxes (C-2296/VRC, C-2797/VRC, and C-2298/VRC) provide a means of keying the receiver-transmitter when the audio accessory push-to-talk switch is set to *radio* position. Simultaneously, the speech signals applied to the audio accessory microphone are applied through the crewmember control box, the AM-1780/VRC, MT-1029/VRC, OA-3633(*)/GRC, and the transmit circuits of the receiver-transmitter to the antenna system.

a. Control, Intercommunication Set C-2298/VRC.

(1) *Circuit setup.* Control of the receiver-transmitter from the C-2298/VRC crewmember boxes is possible when the AM-1780/VRC RADIO TRANS switch S502 is set to CDR ONLY or CDR + (plus) CREW, the INSTALLATION switch is set to OTHER, the MAIN PWR switch is set to NORM, and the PWR CKT BKR switch CB501 is set to ON. When the PWR CKT BKR switch is set to ON, dc power is applied to the amplifiers A80 in the control boxes (fig. 4-5), to enable them to amplify the audio signals transmitted from the crewmember audio accessories. Received signals (para 2-5), either from the receiver-transmitter or from other crewmembers in the system, are not amplified in the intercom receive circuits.

(2) *Keying transmitter.* When the audio accessory push-to-talk switch is depressed, a ground is applied to the transmit circuits of the receiver-transmitter, which, in turn, causes the transmitter to set up for transmit mode in order to permit speech signals ((3) below) to be applied to the distant radio station.

Unit	From	To
C-2298/VRC	J802, pin C	S801 (ALL and A positions)
	S801	J801, pin D
CX-4723/VRC	Pin D	Pin D
AM-1780/VRC	J504, pin D	S502 (CDR ONLY or CDR + CREW position)
	S502	S501 (OTHER and INT positions)
	S501	J501, pin S
CX-4723/VRC	Pin S	Pin S
MT-1029/VRC	J22, pin S	J24, pin S

See footnote at end of table.

Unit	From	To
4-2060(*)/VRC	J3, pin H*	K1, terminal 5
	J3, pin H*	J2, pin C
CX-4655/GRC	Pin C	Pin C
Receiver-transmitter	J3, pin C	Relay K3, terminal 5

* Indicates parallel connection from J3, pin H.

(3) *Radio transmission.* After the receiver-transmitter is keyed ((2) above), and the operator at the C-2298/VRC talks into the microphone of the audio accessory connected to J802, voice signals are applied through the C-2298/VRC audio amplifier A80, and then through the AM-1780/VRC to the transmit circuits of the receiver-transmitter.

Unit	From	To
C-2298/VRC	J802 or J503, pin D	Amplifier A80, terminal 2
	Amplifier A80, terminal 4	S801
	S801	J801, pin K
CX-4723/VRC	Pin K	Pin K
AM-1780/VRC	J504, pin K	K502, terminals 2 and 4
	K502, terminal 4	J501, pin U
CX-4723/VRC	Pin U	Pin U
MT-1029/VRC	J22, pin U	J24, pin N
AM-2060(*)/VRC	J3, pin N	J2, pin D
CX-4655/GRC	Pin D	Pin D
Receiver-transmitter	J3, pin D	Module A22

b. Control, Intercommunication Set C-2297/VRC.

(1) *Circuit setup.* The circuit setup is the ıe as given for the C-2298/VRC in *a* (1) ɔove.

(2) *Keying transmitter.* When the push-to-talk switch of the audio accessory at connector J902 is depressed, a ground is applied to the transmit circuits of the receiver-transmitter, which, in turn, causes the transmitter to set up for transmit mode to permit speech signals ((3) below) to be applied to the distant radio station.

Unit	From	To
C-2297/VRC	J902, pin C	S902 (ALL and A positions)
	S902	J904, pin D
C-1723/VRC	Pin D	Pin D
AM-1780/VRC	J505 (J506, J507), pin D	K501, terminals 4 and 3
	K501, terminal 3	S502 (CDR + CREW position)
	S502	S501 (OTHER and INT ONLY positions)
	S501	J501, pin S
CX-4723/VRC	Pin S	Pin S
MT-1029/VRC	J22, pin S	J24, pin H
AM-2060(*)/GRC	J3, pin H*	K1, terminal 5
	J3, pin H*	J2, pin C
CX-4655/GRC	Pin C	Pin C
Receiver-transmitter	J3, pin C	K2, terminal 5

* Indicates parallel connection from J3, pin H.

(3) *Radio transmission.* After the transmit-is keyed ((2) above) and the operator at the -2297/VRC speaks into the microphone of the audio accessory connected to J802, voice signals are applied through the C-2297/VRC amplifier A80, and through the AM-1780/VRC to the transmit circuits of the receiver-transmitter.

Unit	From	To
C-2297/VRC	J902 or J903, pin D	Amplifier A80, terminal 2
	Amplifier A80, terminal 4	S902
	S902	J904, pin K
CX-4723/VRC	Pin K	Pin K
AM-1780/VRC	J505 (J506, J507), pin K	K502, terminals 13 and 12
	K502, terminal 12	J501, pin U
CX-4723/VRC	Pin U	Pin U
MT-1029/VRC	J22, pin N	J24, pin N
AM-2060(*)/GRC	J3, pin N	J2, pin D
CX-4655/GRC	Pin D	Pin D
Receiver-transmitter	J3, pin D	Module A22

c. Control, Intercommunication Set C-2296/VRC. The C-2296/VRC is usually mounted on the outside of the vehicle.

(1) *Circuit setup.* The circuit setup is the same as given in *a*(1) above. In addition, the OFF-EXT switch S901 in the C-2297/VRC must be set to EXT. This operation permits communication from the C-2296/VRC to pass through the C-2297/VRC into the intercom and radio system circuits. It also lights the EXT lamp on the C-2297/VRC to alert the C-2297/VRC user that the external C-2296/VRC is in the circuit.

(2) *Keying transmitter.* To communicate on the radio system, the C-2296/VRC INT-RAD TRANS switch S61 is set to RAD TRANS position. When the H-207/VRC push-to-talk switch is depressed, a ground is applied to the transmit circuits of the receiver-transmitter, which, in turn, causes the transmitter to set up for transmit mode to permit speech signals ((3) below) to be applied to the distant radio station.

Unit	From	To
C-2296/VRC	TB61, pin 4	S61 (RAD TRANS position)
	S61	J61, pin H
Cable (fig. 4-5, note 9)	Pin H	Pin H
C-2297/VRC	J901, pin J	S901 (EXT position)
	J901	S902
	S902	J904, pin D
CX-4723/VRC	Pin D	Pin D
AM-1780/VRC	J505 (J506, J507), pin D	K501, terminals 4 and 3
	K501, terminal 3	S502 (CDR + CREW position)
	S502	S501 (OTHER and INT ONLY positions)
	S501	J501, pin S
CX-4723/VRC	Pin S	Pin S
MT-1029/VRC	J22, pin S	J24, pin H
AM-2060(*)/GRC	J3, pin H*	K1, terminal 5
	J3, pin H*	J2, pin C
CX-4655/GRC	Pin C	Pin C
Receiver-transmitter	J3, pin C	K2, terminal 5

* Indicates parallel connection from J3, pin H.

(3) *Radio transmission.* After the transmitter has been keyed ((2) above) and the operator speaks into the H-207/VRC microphone, voice signals are applied through the C-2296/VRC amplifier A80, the C-2297/VRC, and the AM-1780/VRC to the transmit circuits of the receiver-transmitter.

Unit	From	To
C-2296/VRC	TB61, pin 3	Amplifier A80, terminal 2
	Amplifier A80, terminal 4	J61, pin K
Cable (fig. 4-5, note 9)	Pin K	Pin K
C-2297/VRC	J901, pin K	S901, (EXT position)
	S901	S902
	S902	J904, pin K
CX-4723/VRC	Pin K	Pin K
AM-1780/VRC	J505 (J506, J507), pin K	K502, terminals 13 and 12
	K502, terminal 12	J501, pin U

See footnote at end of table.

Unit	From	To
CX-4723/VRC	Pin U	Pin U
MT-1029/VRC	J22, pin U	J24, pin N
AM-2060(*)/GRC	J3, pin N	J2, pin D
CX-4655/GRC	Pin D	Pin D
Receiver-transmitter	J3, pin D	Module 22

2-5. Receiver-Transmitter Received Audio Signal Distribution, Including Crewmember Boxes

(fig. 4-6)

Received audio signals from the receiver-transmitter are applied to the AM-2060(*)/GRC and through the MT-1029/VRC, system cabling, and the AM-1780/VRC, to the crewmember control boxes (C-2296/VRC, C-2297/VRC, and C-2298/VRC). Individual selector switches and volume controls in the crewmember control boxes are used to select the signal to be monitored, and to adjust the audio signal level.

a. AM-2060 (*)/GRC Loudspeaker. Audio signals can be heard on the AM-2060(*)/GRC internal loudspeaker when the SPKR switch is set to ON. Audio signals from the receiver-transmitter are applied to the loudspeaker as follows:

Unit	From	To
Receiver-transmitter	Module A25/A55	J3, pin B
CX-4655/GRC	Pin B	Pin B
AM-2060(*)/GRC	J2, pin B	Audio amplifier Q1, Q2
	Audio amplifier Q1, Q2	S1 (ON position)
	S1	Relay K1, terminals 2 and 1
	Relay K1, terminal 1	LS1 (through P1, J1)

b. Unmuted Audio Signals to Crewmember Control Boxes. When the crewmember control box MONITOR switch is set to A position, unmuted (full strength) audio signals from the receiver-transmitter can be heard at the audio accessory at the crewmember control boxes. Unmuted audio signals are distributed to the crewmember control boxes as follows:

Unit	From	To
Receiver-transmitter	Module A25/A55	J3, pin B
CX-4655/GRC	Pin B	Pin B
AM-2060(*)/GRC	J2, pin B	Audio amplifier Q1, Q2
	Audio amplifier Q2	J3, pin S
MT-1029/VRC	J24, pin S	J22, pin H
CX-4723/VRC	Pin H	Pin H
AM-1780/VRC	J3, pin H	K501, terminals 9 and 10
	K501, terminal 10	J504, pin M
CX-4723/VRC	Pin M	Pin M
C-2298/VRC	J801, pin M	S801 (A position)
	S801	R801 (VOLUME control)
	R801	J802 and J803, pins B and E to audio accessory earphones
AM-1780/VRC	K501, terminal 10[a]	J505 (J506, J507), pin M
CX-4723/VRC	Pin M	Pin M
C-2297/VRC	J904, pin M	S902 (A position)
	S902[b]	R902 (VOLUME control)
	R902	J902 and J903, pins B and E to audio accessory earphones
	S902[b]	S901 (EXT position)
	S901	J901, pin J
Cable (fig. 4-6, note 7)	Pin J	Pin J
C-2296/VRC	J61, pin J	R61 (VOLUME control)
	R61	TB61, pin 5
	TB61, pin 5	H-207/VRC earphone

[a] Indicates parallel connections from K501, terminal 10.
[b] Indicates parallel connections from S902.

c. Muted Audio Signals to Crewmember Control Boxes. When a crewmember control box MONITOR switch is set to ALL position, muted audio signals (reduced strength by passage through R15 in AM-2060(*)/GRC) can be heard at the audio accessory at each crewmember control box. The receiver-transmitter audio signal is reduced so that the intercom audio signals among the crewmembers can be heard over the radio audio signals, since both sources of audio signal are available when the crewmember control box MONITOR switch is set to ALL position. Muted audio signals received at the receiver-transmitter are distributed to the crewmember control boxes as follows:

Unit	From	To
Receiver-transmitter	Module A25/A55	J3, pin B
CX-4655/GRC	Pin B	Pin B
AM-2060(*)/GRC	J2, pin B	Audio amplifier Q1, Q2
	Audio amplifier Q2	R15 (muting resistor)
	R15	J3, pin K
CX-4723/VRC	Pin K	Pin K
AM-1780/VRC	J501, pin K	S503 (OFF position)
	S503	K502, terminals 18 and 19
	K502, terminal 19	Interphone amplifier A520
	Interphone amplifier A520*	J504, pin L
CX-4723/VRC	Pin L	Pin L
C-2298/VRC	J801, pin L	S801 (ALL position)
	S801	R801 (VOLUME control)
	R801	J802 and J803, pins B and E to audio accessory earphones
AM-1780/VRC	Interphone amplifier A520*	J505 (J506, J507), pin L
CX-4723/VRC	Pin L	Pin L
C-2298/VRC	J904, pin L	S902 (ALL position)
	S902*	R902 (VOLUME control)
	R902	J902 and J903, pins B and E, to audio accessory earphone
	S902*	S901 (EXT position)
	S901	J901, pin J
Cable (fig. 4-6, note 7)	Pin J	Pin J
C-2296/VRC	J61, pin J	R61 (VOLUME control)
	R61	TB61, pin 5
	TB61, pin 5	H-207/VRC earphone

* Indicates parallel connections from interphone amplifier A520.
* Indicates parallel connections from S902.

Section II. RETRANSMISSION CIRCUIT FUNCTIONING

2-6. Radio Retransmission Circuits, General (fig. 4-7 and 4-8)

a. The receiver-transmitter in the AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160 can be connected with another receiver-transmitter for the purpose of setting up a radio relay site for automatic retransmission of radio signals from radio stations that are too far distant from each other for direct radio communication. The other receiver-transmitter at the relay site can be the RT-505/PRC-25 or RT-841/PRC-77 (para 2-7), or it can be the RT-246(*)/VRC or RT-542(*) /VRRC (para 2-8) from the AN/VRC-12 radio series. (RT-246(*)/VRC and RT-524(*)/VRC represent all models of each receiver-transmitter.)

b. Retransmission Cable Kit MK-456/GRC is used to provide the connection between the receiver-transmitters at the relay site. The MK-456/GRC consists of a canvas bag and a 50-foot Cable Assembly, Special Purpose, Electrical CX-4656/GRC. Two circuit boxes, a choke box, and filter box (fig. 4-7) are included in the cable assembly. An audio accessory can be connected to the receptacle on the choke box to monitor audio signals applied through the retransmission circuits. When the two radios at the relay site are set up for providing retransmission to the two distant radio stations, the keying of one relay site receiver-transmitter to send the signals to one distant radio station is automatically arranged by the other relay site receiver-transmitter that is receiving the signal from the other distant radio station.

2-7 Retransmission Using RT-505/PRC-25's or RT-841/PRC-77's

a. Basic Setup. The CX-4656/GRC connection between the two receiver-transmitters No. 2 and No. 3 at the relay site is shown in note 5, figure 4-7. On the receiver-transmitters, the function switches are set to RETRANS. The distant radio stations must be set up for squelch operation in order to provide the automatic sending of the 150-Hz squelch signal when they are keyed for transmission. When the relay site receiver-transmitters are set up for retransmission, the 150-Hz squelch signal is used to operate relays for automatic retransmission and keying of the sending receiver-transmitter.

b. Circuit Functioning. Under the setup in *a* above, the retransmission circuits perform as given in (1) through (8) below.

(1) Before a radio signal is received from either distant radio station, the relay site receiver-transmitters are in standby mode. Under this condition, the audio output transformers in receiver amplifiers A25/A55 are grounded through contacts of squelch relay K1 and function switch S1. Thus, no audio signals can pass between the relay site radios.

(2) When a signal, including the 150-Hz squelch signal, is received at receiver-transmitter No. 2, it is applied through RF-IF amplifiers and discriminator to receiver audio amplifier A25/A55.

(3) From the discriminator, the 150/Hz squelch signal is applied to squelch relay control A24/A54. A24/A54 then provides a closed circuit to operate relay K3. When K3 operates, contact 8-3 remove the short from audio output transformer in A25/A55 ((1) above).

(4) Simultaneously, ground on audio output transformer in A25/A55 is provided through the function switch and applied through the diode in the CX-4656/GRC, and through receiver-transmitter No. 3 relays K1 and K2 to the battery. Thus, contacts 4-7 of relay K1 provide 10 volts operating power to receiver-transmitter No. 3 transmitting circuits.

(5) With the transmitting circuits in receiver-transmitter No. 3 in transmit mode, speech signals now can be applied from receiver-transmitter No. 2 through the CX-4656/GRC to receiver-transmitter No. 3 speech amplifier A22, and through the transmitting amplifier and P.A. stages to the antenna for transmission to radio station No. 4.

(6) When radio station No. 1 ceases keying its transmitter, receiver-transmitters No. 3 and No. 2 go into standby condition as described in (1) above.

(7) When radio station No. 4 keys its transmitter and transmits its signals, receiver-transmitters No. 3 and No. 2 perform in the same manner as described in (2) through (5) above.

(8) When an audio accessory is connected to the audio accessory receptacle on the CX-4656/GRC network box, the audio accessory circuits are effectively connected to the output audio circuits of reciver-transmitter No. 3 (the one next to the choke box of the CX-4656/GRC 48 feet away). Accordingly, the audio accessory user can perform the following operations.

(*a*) Hear the signal being transmitted from radio station No. 4 to radio station No. 1.

(*b*) While receiver-transmitter No. 2 is keyed (by squelch tone from No. 4), the user can talk to radio station No. 1.

(*c*) If the radios are on standby, the user can key (through pin C) and transmit (through pin D) over receiver-transmitter No. 3 to No. 4. The reply from radio station No. 4 will be heard (through pin B). The action will also cause the reply to be heard at radio station No. 1

(*d*) To transmit to radio station No. 1, the user must transfer the audio accessory to the AUDIO connector on receiver-transmitter No. 2, which is next to the network box of the CX-4656/GRC (2 feet away).

2-8. Retransmission Using Receiver-Transmitters, Radio RT-246(*)/VRC or RT-524(*)/VRC with RT-505/PRC-25 or RT-841/PRC-77

NOTE

RT-246(*)/VRC and RT-524(*)/VRC represent all models of each receiver-transmitter.

When the RT-505/PRC-25 or RT-841/PRC-77 is connected to the RT-246(*)/VRC or RT-524(*)/VRC for retransmission, the circuit performance of the radios during retransmission is similar to that described in paragraph 2-7. Refer to figure 4-8 for the following circuit functioning descriptions.

a. Basic Setup. The CX-4656/GRC connection between receiver-transmitters No. 2 and 3 is shown in figure 4-8. On receiver-transmitter No. 2, the function switch is set to RETRANS; on receiver-transmitter No. 3, the SQUELCH switch is set to NEW ON or OLD ON, depending on the radio station used at radio station No. 4.

b. Circuit Functioning. Under the setup in *a* above, the retransmission circuits function as given in (1) through (7) below.

(1) Before the RF signals are received from either distant radio station, the relay site receiver-transmitters are in standby mode. Under this situation, the output transformers, in A25/A55 in No. 2 and T5001 in No. 3, are grounded through contacts of their associated squelch relays. Thus, no signals can pass between the relay site receiver-transmitters.

(2) When a signal including the 150-Hz squelch signal is received at receiver-transmitter No. 2, it is applied through RF-IF amplifiers and the discriminator to receiver audio amplifier A25/A55.

(3) From the discriminator, the 150-Hz squelch signal is applied to squelch relay control A24/A54. A24/A54 then provides a closed circuit to operate relay K3. When K3 operates, contacts 8–3 remove the short from output transformer in A25/A55 ((1) above).

(4) Simultaneously, ground on the output transformer in A25/A55 is provided through function switch S1 and applied through diode CR2 in the CX–4656/GRC and through receiver-transmitter No. 3 relays K405 and K401 to the 25-volt battery. Thus, contacts 4–7 of K1 provide operating power continuity to receiver-transmitter No. 3 transmitting circuits by the operation of relays K405 and K401.

(5) With the transmitting circuits in receiver-transmitter No. 3 in transmit mode, speech signals can now be applied from receiver-transmitter No. 2 A25/A55 through the CX–4696/GRC to receiver-transmitter No. 3 transmit circuits, and to the antenna for transmission to radio station No. 4.

(6) When radio station No. 1 ceases keying its transmitter, receiver-transmitters No. 2 and 3 go into standby condition ((1) above).

(7) When radio station No. 4 keys its transmitter and transmits its signals, the operation of the circuits in receiver-transmitters No. 3 and 2 are accomplished as follows:

(*a*) When a signal including a squelch signal (150-Hz or noise) is received at receiver-transmitter No. 2, it is applied through the receive circuit.

(*b*) In the receive circuit, the squelch signal is applied to squelch control A5200, causing squelch relay K5002 to operate. When K5002 operates, a ground is provided through contacts 2–5 of K505, CR303 (in RT–246(*)/VRC), or CR351 (in RT–524(*)/VRC), and the CALL lamp to the 25-volt battery.

(*c*) At the same time, the ground is provided through the CX–4656/GRC (pins E–C) and relays K1 and K2 to the 12.5–15 volt batter in receiver-transmitter No. 2.

(*d*) With the transmitting circuits in receiver-transmitter No. 2 in transmit mode by the operations of K1 and K2, speech signals can now be applied from T5005 in receiver-transmitte No. 3 through the CX–4656/GRC (pins E–C) and the transmitting circuits in receiver-transmitter No. 2 to the antenna for transmission to radio station. No.1.

(*e*) When radio station No. 4 ceases keying its transmitter, receiver-transmitters No. 3 and 2 go into standby condition ((1) above).

(*f*) Diode CR1 in the C–E circuit of the CX–4656/GRC is provided to keep the two different battery potentials separated when the receiver-transmitters No. 3 and 2 are in standby. The diode prevents receiver-transmitter No. 2 from going into transmit mode by the operation of K1 and K2. Under this condition, the circuit performs as follows:

NOTE

If the CX–4656/GRC cable connects to the receiver-transmitters shown in figure 4–8 diode CR2 in the C-E circuit would perform the operations described for CR1 below.

1. When receiver-transmitter No. 2 is connected to another RT–505/PRC–25 or RT–841/PRC–77, a squelch signal received by No. 3 provides a simple ground to the battery in No. 2 which causes relays K1 and K2 to operate for transmission (fig. 4–3 and para 2–7*b*(4)).

2. However, when an RT–246(*)/VRC or RT–524(*)/VRC is used as receiver-transmitter No. 3, there are two different battery potentials, 12.5–15 volts in No. 2 and 25 volts in No. 3. If there were no diode CR1 in the CX–4656/GRC when the receiver-transmitters are in standby, the two batteries would be connected in series (B, fig. 4–8). When two such opposing potentials meet, a voltage difference (between 10 and 12.5 volts) would be sufficient to operate K1 and K2 into transmit mode in receiver-transmitter No. 2.

3. The diode in CX–4656/GRC preven this extra voltage from operating K1 and K2. Th remaining voltage is blocked because the potential (which takes on the polarities of the 25-volt battery) would apply a negative potential to th anode of the diode. Thus, no current can flow operate K1 and K2 in receiver-transmitter No. 2.

Section III. AMPLIFIER-POWER SUPPLY GROUP OA-3633(*)/GRC, CIRCUIT FUNCTIONING

2-9. Amplifier-Power Supply AM-2060(*)/GRC, Block Diagram (fig. 2-1)

The AM-2060(*)/GRC is the main component of the OA-3633(*)/GRC; the other component is Cable Assembly, Special Purpose, Electrical CX-4656/GRC (para 2-11, fig. 3-5). The CX-4656/GRC provides dc power and audio signal connection between the receiver-transmitter and the AM-2060(*)/GRC. The AM-2060(*)/GRC converts vehicular battery power (24 ±3 volts dc) to the operating voltages for the receiver-transmitter (*a* below), and amplification of the receiver-transmitter received audio signals for application to the loudspeaker in the AM-2060(*)/GRC (*c*(1) below), and to the crewmember control boxes when they are a part of the system (*c*(2) below). The vehicular battery power is also applied to Antenna Matching Unit MX-2799/VRC (part of Antenna AT-912/VRC) or to Matching Unit-Base, Antenna MX-6707/VRC (part of Antenna AS-1729/VRRC) (*b* below).

a. Operating Voltages to Receiver-Transmitter. The nominal 25.5 volts dc from the power source, normally a vehicular battery, is applied through the MT-1029/VRC and PWR circuit breaker CB1 to series regulator Q3 and dc amplifier Q4, voltage dropping resistor R17, ANT. FREQ. CONTROL switch S2, and audio amplifiers Q1 and Q2.

(1) Series regulator Q3 and dc amplifier Q4 convert and control the applied 25.5 volts dc to a regulated 13 and 3 volts dc. The 13 volts is for use in the receiver-transmitter where it is converted to 10 volts for the transmit and receive circuits. In the RT-505/PRC-25 only, the 3 volts dc is used for interval oscillator A10.

(2) Voltage dropping resistor R17 lowers the applied 25.5 volts dc to 2.6 ±0.3 volts dc. This voltage is used only in the RT-505/PRC-25 as filament voltage for power amplifier V1 when the RT-505/PRC-25 is in transmit mode.

b. Operating Voltages Applied to MX-2799/VRC and MX-6707/VRC. The nominal 25.5 volts dc is applied through ANT. FREQ. CONTROL switch S2 to the MX-2799/VRC or MX-6707/VRC. The voltage is used by the MX-2799/VRC and MX-6707/VRC to control the settings of the matching circuits to provide a close impedance match for the whip antenna at the operating frequency of the receiver-transmitter. Switch S2 is set to a position that includes the receiver-transmitter operating frequency.

c. Audio Amplifiers Q1 and Q2. The audio output of the receiver-transmitter is applied to audio amplifiers Q1 and Q2.

(1) *Remote audio output.* Amplifiers Q1 and Q2 amplify the audio signals applied to it from the receiver-transmitter and provide two outputs, muted and unmuted. The output signals are applied to crewmember control boxes when they are part of the system.

(2) *Local audio output.* The amplifier audio signals from Q1 and Q2 are also applied through SPKR switch S1 to receive-transmit relay K1. When the receiver-transmitter is keyed for transmission, the keying relay in the receiver-transmitter is operated which causes +13 volts dc to be applied to the winding of keying relay K1 in the AM-2060(*)/GRC. When K1 operates, it disconnects the audio signal from the loudspeaker, and thus prevents feedback from the loudspeaker to the audio accessory microphone.

2-10. AM-2060(*)/GRC, Circuit Functioning

a. Audio Amplifiers Q1 and Q2. Q1 and Q2 provide amplification of the audio output signals from the receiver-transmitter. The amplified audio output is applied to the AM-2060(*)/GRC loudspeaker and to the audio accessories of the associated crewmember control boxes.

(1) The audio output signal at pin B of SET POWER connector J2 is coupled through impedance matching transformer T1 to the base of push-pull amplifiers Q1 and Q2. The amplified audio output is applied to the primary (terminals 1 and 3) of transformer T2. The audio output across one-half of the secondary of T2 (terminals 4 and 5) is coupled through SPKR switch S1 (ON position) and relay K1 (contacts 8 and 2) to loudspeaker LS1. The audio output across the secondary of T2 (terminals 4 and 6) is applied through limiting resistor R15 to pin K of POWER INPUT connector J3 to provide a muted audio output; and to pin S of J3 to provide an unmuted audio output to the crewmember control boxes.

(2) A voltage-dividing network, composed of resistors R2 and R3, and temperature-compensating thermistor RT1 provide base-to-emitter bias for Q1 and Q2. Thermistor RT1 has a nega-

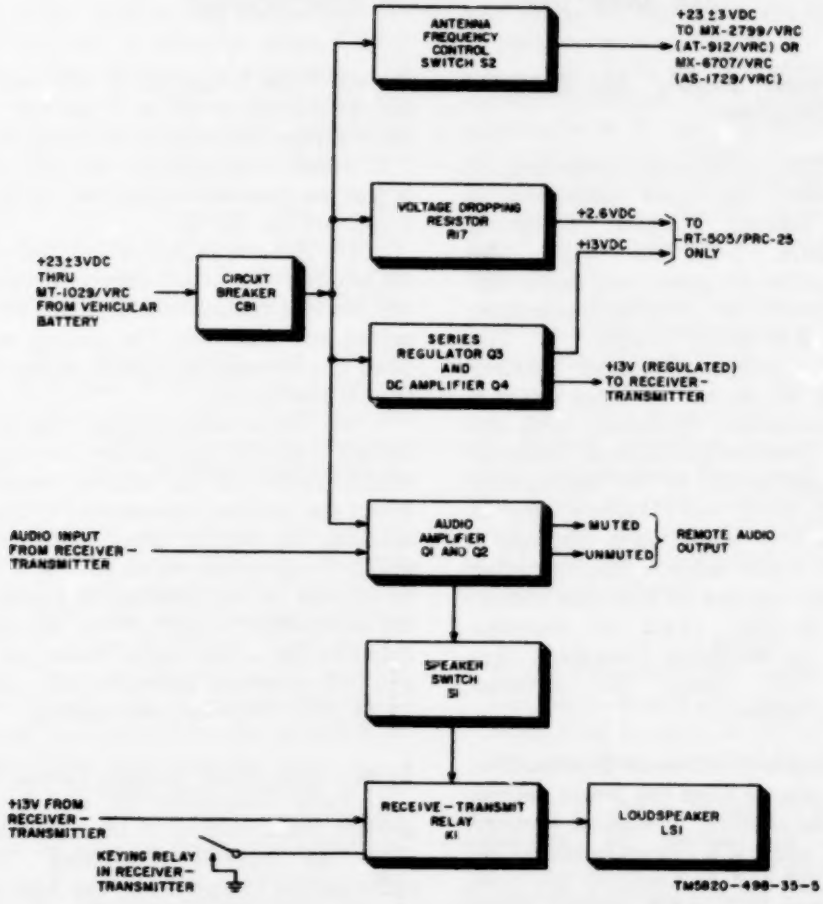


Figure 2-1. Amplifier-Power Supply AM-2060(*)/GRC, block diagram.

tive temperature coefficient to compensate for temperature variations during operation. Resistors R1 and R4 provide negative feedback to the base of Q1 and Q2 to control the gain of the amplifier. Resistors R7 and R8 prevent current saturation of Q1 and Q2.

(3) A +13-volt dc output from the receiver-transmitter is applied to contact 1 of relay K1 through pin N of connector J3. When the receiver-transmitter is keyed, a ground is applied through pin C of J3 to energize K1. When K1 is energized, loudspeaker LS1 is disconnected from the circuit, and a remote muting path (pin D of J3) is grounded through closed contacts 4 and 7. Energizing relay K1 mutes any audio accessory at the crewmember control boxes. When LS1 is disconnected from the circuit (K1 energized), resistors R12 and R13 act as a load for the secondary of transformer T2. When the SPKR switch is at OFF, resistor R16 acts as the output load for the audio amplifier through closed contacts 2 and 3 of S1. Resistors R14 and R18 provide impedance matching for the audio accessories at the crewmember control boxes.

b. Series Regulator Q3 and Dc Amplifier Q4. Series regulator Q3 and dc amplifier Q4 reduce the 25.5-volt dc power from the vehicular battery to 13 volts and 3 volts dc, and regulates these voltages. The 13 volts dc is applied to the RT-505/PRC-25 or RT-841/PRC-77; the 3 volts dc is used only by the RT-505/PRC-25.

(1) The +25.5-volt dc input at pin J or POWER INPUT connector J3 is applied through CB1, bias resistor R5 to the collector of Q3, and bias resistor R6 to the base of Q3 and the collector of Q4. The regulated +13 volts that appears across filter capacitor C1 is applied to pin E of SET POWER connector J2. The regulated +3

volts that appears across resistor R19 is applied to pin M of connector J2.

(2) Bias for Q4 is supplied from a voltage-dividing network composed of R9, R10, R11, and R19 connected between the collector of Q3 and ground. Diode CR1 references the emitter of Q4 to ground. Diode CR2 references the base of Q4 to the +13-volt output. Regulating action is described in (3) below.

(3) If the input voltage to Q3 decreases, the 13-volt output decreases. Capacitor C1, charged to the 13-volt level, will begin to discharge as the output voltage drops, tending to maintain a constant output until the regulating action occurs. As the output voltage decreases, the voltage drop across R9, R11, and R19 decreases, reducing forward bias on Q4, which will decrease its emitter-to-collector current flow. The reduced emitter-to-collector current of Q4 reduces the voltage drop across resistor R6, increasing the forward bias of Q3. Emitter-to-collector current flow in Q3 will increase, decreasing emitter-to-collector resistance. The voltage drop through Q3 will decrease and allow the output to return to the desired level of 13 volts. If the supply voltage increases to the normal 25.5-volt level, Q4 will decrease the forward bias on Q3 to maintain the constant 13-volt output. Resistor R10 is adjusted to produce the required 13-volt output from the voltage regulator.

c. ANT. FREQ. CONTROL Switch S2. The +25-volt dc input at pin J of POWER INPUT connector J3 is applied through PWR circuit creaker CB1 and switch S2 to the MX-2799/VRC of the AT-912/VRC or to MX-6707/VRC of the AS-1729/VRC, whichever is connected to the AM-2060(*)/GRC. Switch S2 is set to the position corresponding to the operating frequency of the associated receiver-transmitter. Capacitors C1 through C7 bypass radiofrequency (RF) from the MX-2799/VRC or MX-6707/VRC to ground.

2-11. Cable Assembly, Special Purpose, Electrical CS-4655/GRC

(fig. 3-5)

The CX-4655/GRC (9 or 11 inches long) and the AM-2060(*)/GRC comprise the OA-3633(*)/GRC. The CX-4655/GRC is provided with two cable connectors either of which is connected to the SET POWER connector on the AM-2060(*)/GRC; the other end of the cable is connected to POWER connector J3 on the receiver-transmitter. The cable carries power, control circuits, and audio signal circuits between the AM-2060(*)/GRC and the receiver-transmitter.

CHAPTER 3

DS AND GS MAINTENANCE
AMPLIFIER-POWER SUPPLY GROUP OA-3633(*)/GRC

NOTE

Throughout these procedures, *receiver-transmitter* refers to Receiver-Transmitter, Radio RT-505/PRC-25 which is used in Radio Sets AN/VRC-53 and AN/GRC-125, and to Receiver-Transmitter, Radio RT-841/PRC-77 which is used in Radio Sets AN/VRC-64 and AN/GRC-160. Both receiver-transmitters are used with Amplifier-Power Supply Group OA-3633(*)/GRC which is also part of these radio sets.

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

3-1. Scope of DS and GS Maintenance

a. The maintenance procedures in this chapter are applicable to DS (direct support) and GS (general support) maintenance facilities and supplement the organizational maintenance procedures described in TM 11-5820-498-12 for the OA-3633(*)/GRC. The systematic troubleshooting procedures which begin with the operational and equipment performance checks that can be performed at an organizational maintenance level are carried to a higher level in this chapter.

b. Refer to paragraph 1-1*b* for a listing of publications that cover the DS and GS maintenance level of the components that are part of the AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160.

c. Refer to paragraph 1-1*c* for a listing of publications that cover the DS and GS maintenance level of the equipment that is used in conjunction with these radio sets.

3-2. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective OA-3633*/GRC is to localize the fault by tracing the trouble to the CX-4655/GRC or to some part of the AM-2060(*)/GRC. The second step is to isolate the fault. Isolation means tracing the fault to a defective part responsible for the abnormal operation. Isolating a fault to a defective part on the plug-in assembly of the AM-2060(*)/GRC is covered in paragraphs 3-8, 3-9, and 3-10. Some faults, such as burned out resistors, arcing, and shorted relay coils and transformer windings can often be located by sight, smell, or hearing. The majority of the faults, however, must be isolated by checking voltages and resistances.

b. Visual Inspection. The purpose of visual inspection is to locate faults without testing or measuring circuits. All visual signs should be observed and an attempt made to localize the fault to a particular area.

c. Testing Procedures. After any repair of the CX-4655/GRC or AM-2060(*)/GRC, always test it for satisfactory performance of all circuits before returning the equipment to the user or placing it in repaired stock. Refer to paragaphs 3-16 through 3-21 for inspection and testing procedures. The procedures can also be used to check the performance of the equipment *before* starting to troubleshoot it.

3-3. Test Equipment, Tools, Materials, and Power Sources Required

a. Test Equipment Required.

Item	Publication
Multimeter ME-26(*)/U*	TM 11-6625-200-15
Generator, Signal AN/URM-127	TM 11-6625-683-15
Voltmeter, Electronic ME-30(*)/U*	TM 11-6625-320-12

Item	Publication
Spectrum Analyzer TS-723(*)/U*	TM 11-5097

* ME-26(*)/U represents ME-26A/U, ME-26B/U, and ME-26C/U.

* ME-30(*)/U represents ME-30A/U, ME-30B/U, ME-30C/U, and ME-30E/U.

* TS-723(*)/U represents TS-723A/U, TS-723B/U, TS-723C/U, TS-723D/U.

b. Materials and Tools Required.

Item	Federal stock No.	Identified in
Resistor, 7.5 ohms (*e* below).		
Resistor, 275 ohms (*e* below).		
Resistor, 14.5 ohms (*e* below)	5905-279-3521	
Resistor, 300 ohms (*e* below)	5905-101-8850	
Mounting MT-1029/VRC	5820-893-1323	TM 11-5820-498-12
Cable Assembly, Power, Electrical CX-4720/VRC (10 ft).	5995-823-2726	TM 11-5820-498-12
Cable Assembly, Special Purpose, Electrical CX-4655/GRC (*e* below).	5995-889-1061	TM 11-5820-498-12
Connector, receptacle, electrical (male, oval; same as J21 in MT-1029/VRC).	5935-853-5876	TM 11-5820-401-35
Connector, receptacle, electrical (female, oval; same as J23 in MT-1029/VRC).	5935-853-5944	TM 11-5820-401-35
Connector, receptacle, electrical (female, elliptical; same as J24 in MT-1029/VRC).	5935-853-6044	TM 11-5820-401-35
Tool Kit, Electronic Equipment TK-100/G.		
Tool Kit, Electronic Equipment TK-105/G.		

Notes

MT-1029/VRC is required if a fabricated power distribution box (*d* below) is not available.
For fabrication of power distribution box (*d* below) as substitute for the MT-1029/VRC.

c. Power Source Required. (1) Power Supply PP-6224/U or PP-2953(*)U may be used to provide the operating dc voltage for the AM-2060(*)/GRC. The PP-2953(*)/U is normal internally adjusted to provide 25.2 volts dc output (TM 11-6130-233-12).

(2) If a dc power source other than the ones in (1) above is used, it should be capable of providing a regulated, filtered, dc output of 25.5 volts dc at approximately 5 amperes.

(3) If the area in which the testing is being performed has difficulty in obtaining an ac power source that is within the operating *ac* input voltage of the PP-2953(*)/U or other power supply), use Variable Power Transformer TF-523/U (fig. 3-3). Refer to TM 11-5950-212-15 for installation and maintenance of the TF-523/U.

d. Power Distribution Box. As a substitute for the MT-1029/VRC which is only used as a connecting device between the dc power source and the AM-2060(*)/GRC during testing and troubleshooting, a power distribution box may be fabricated. Refer to paragraph 3-4*b* for fabrication details.

e. Transmit and Receive Dummy Load Assemblies. Fabricate two dummy load assemblies to imitate the transmit and receive states of the receiver-transmitter that would be connected to the AM-2060(*)/GRC SET POWER connector through the CX-4655/GRC.

(1) Remove the two connector plugs from the CX-4655/GR C(*b* above).

(2) Designate one of the connector plugs as the transmit dummy load assembly, and connect the load resistors (*b* above) as shown in figure 3-1.

(3) Designate one of the connector plugs as the receive dummy load assembly, and connect the load resistors (*b* above) as shown figure 3-1.

3-4. Connecting Dc Power to AM-2060(*)/GRC

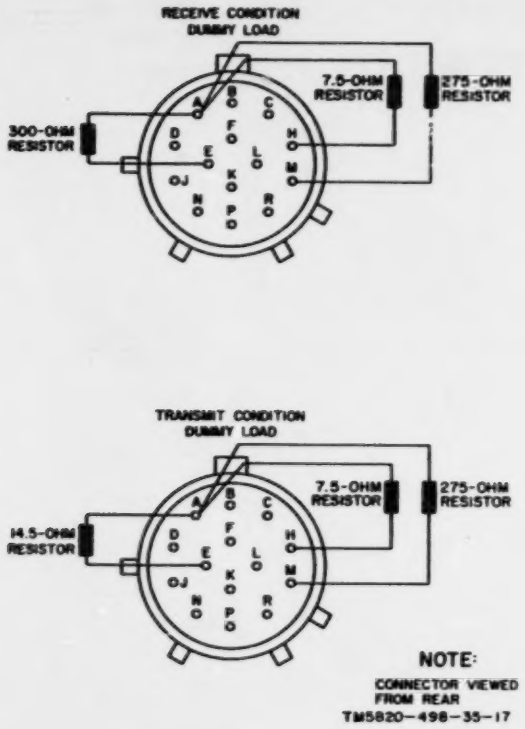
There are two methods for connecting dc power to the AM-2060(*)/GRC. One method is to use the MT-1029/VRC (*a* below); the other method is to use a fabricated power distribution box (*b* below).

CAUTION 1

Before making dc power connections, make sure the dc power supply POWER switch and the PWR switch on the AM-2060(*)/GRC are set to off.

CAUTION 2

If the CX-4720/VRC power cable is used (*a*(2) and *b*(4) below), make sure the red-white leads are connected to the plus (+) ter-



gure 3-1. Fabrication of transmit and receive dummy load assemblies.

minal of the dc power supply, and the blue-green leads are connected to the minus (−) terminal of the dc power supply.

a. Using Mounting MT-1029/VRC. Before using the MT-1029/VRC, check to see that the link in the connecting box is positioned as shown in figure 3-2 for directing power to the AM-2060(*)/GRC.

NOTE

If the link were positioned between pivot and terminal E22 as shown in dashed lines in figure 3-2, no power would be applied to the AM-2060(*)/GRC when the PWR switch is set to ON. (See MT-1029/VRC in figure 4-4.).

(1) *Using PP-2953 (*)/U.*

(*a*) If the PP-2953(*)/U is used, connect t CX-4721/VRC between the PP-2953(*)/U d the MT-1029/VRC as shown in figure 3-3.

NOTE

Since the PP-2953(*)/U can supply up to approximately 10 amperes, two OA-3633(*)/GRC may be tested at the same time, including receiver-transmitters, as shown in figure 3-3.

NOTE

The PP-2953(*)/U is normally internally adjusted for 25.2 volts dc output (TM 11-6130-233-12). Throughout this manual, a dc power source of 25.5 volts dc is indicated. Accordingly, if the PP-2953(*)/U is used, 25.2 volts dc should be measured where 25.5 volts is mentioned.

(*b*) Connect the PP-2953(*)/U to the ac power source.

NOTE

If the TF-523/U is required (para 3-3*c*), connect it between the ac power source and the PP-2953(*)/U as shown in figure 3-3. Refer to TM 11-5950-212-15 for instructions to modify the PP-2953(*)/U's CX-4524/U for use with the PP-2953(*)/U. Set the TF-523/U POWER switch to OFF and the VOLTS ADJUST control fully counterclockwise (0 volt output) before making connections.

(*c*) Lay the AM-2060(*)/GRC on the MT-1029/VRC and push it back until the connectors are fully together. Fully tighten the MT-1029/VRC mounting clamps to hold the AM-2060(*)/GRC in place.

NOTE

A receiver-transmitter can be mounted on the AM-2060(*)/GRC and connected to it using the CX-4655/GRC.

(*d*) To turn on the equipment, set the PP-2953(*)/U AC and DC power switches to ON; the NORM indicator lamp should light. Set the PWR switch on the AM-2060(*)/GRC to ON when desired. If the TF-523/U is used, set its POWER switch to ON and adjust the control until the voltmeter indicates 115 volts. The amount of current drawn by the equipment will be shown on the ammeter.

(2) *Dc power source other than PP-2953 (*)/U.*

(*a*) If a dc power source other than the PP-2953(*)/U is used ((1) above), connect the MT-1029/VRC to the dc power source; use the CX-4720/VRC (fig. 3-3). (See caution 2 above.)

(*b*) Lay the AM-2060(*)/GRC on the MT-1029/VRC and push it back until the AM-2060(*)/GRC and MT-1029/VRC connectors are firmly together. Fully tighten the MT-1029/VRC mounting clamps to hold the AM-2060(*)/GRC in place.

NOTE

A receiver-transmitter can be mounted on the AM-2060(*)/GRC and connected to it using the CX-4655/GRC.

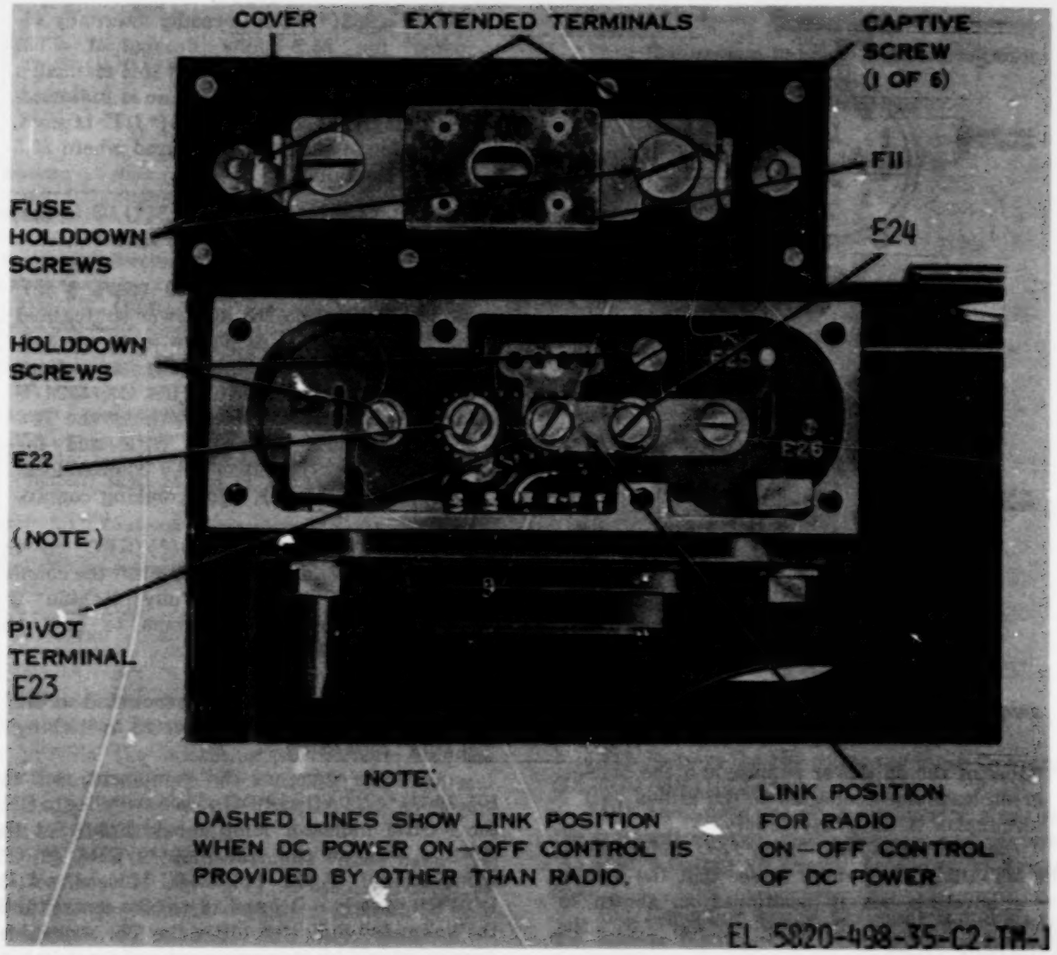


Figure 3-2. View of MT-1029/VRC connector box with cover removed showing position of link.

(c) Turn on and adjust the output of the dc power supply to 25.5 volts. Set the PWR switch on the AM-2060(*)/GRC to ON when desired.

b. Using Fabricated Power Distribution Box (fig. 3-4). When the MT-1029/VRC is not available, dc power may be applied to the AM-2060(*)/GRC through a power distribution box, fabricated and used as follows:

(1) Obtain the MT-1029/VRC oval power receptacles J21 (male) and J23 (female), and the elliptical power receptacle J24 (para 3-3*b*).

(2) Fabricate a small, sturdy, metal box large enough to mount the two oval receptacles and the elliptical receptacle. Mount the oval receptacles on the rear of the box, and the elliptical receptacle on the front of the box (fig. 3-4).

(3) Interconnect the following pins of the receptacles; use insulated #14 AWG wire:

(*a*) Interconnect pins A(+) and B(-) of the oval receptacles.

(*b*) Interconnect pins A and B of one of the oval receptacles with pins A and J of the elliptical receptacle.

(4) To make the power connections, proceed as follows:

(*a*) Turn off the dc power supply being used, and connect the CX-4720/VRC to it; see caution 2 above. Connect the other end of the CX-4720/VRC to the male receptacle on the power distribution box (D, fig. 3-4).

(*b*) Connect the elliptical receptacle on the power distribution box to POWER INPUT receptacle on the rear of the AM-2060(*)/GRC.

(*c*) The female receptacle on the power distribution box may be connected to another piece of equipment using the CX-4721/VRC.

(*d*) Turn on and adjust the output of the dc power supply to 25.5 volts. Set the PWR switch on the AM-2060(*)/GRC to ON when desired.

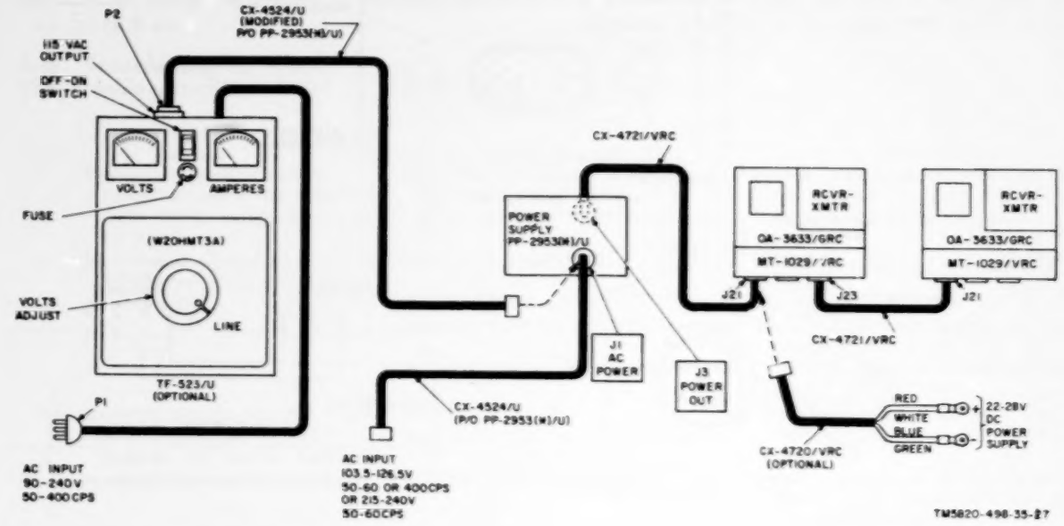


Figure 3-3. Connecting power to OA-3633/GRC using PP-2953(*)/U and TF-523/U.

Section II. OA-3633(*)/GRC, TROUBLESHOOTING PROCEDURES

3-5. Troubleshooting OA-3633(*)/GRC

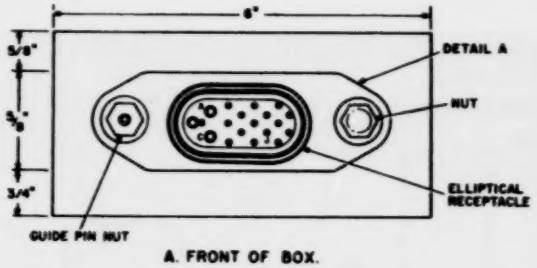
a. When the AM-2060(*)/GRC resistors R6, R7, and R8 (fig. 3-18) are charred, there will be no audio output from the AM-2060(*)/GRC to the receiver-transmitter. These charred resistors usually indicate that the power cable in the vehicle (usually the CX-4720/VRC) in which the AM-2060(*)/GRC had been used, had been connected incorrectly to the vehicular battery. That is, the CX-4720/VRC negative leads (blue-green) had been connected to the battery *positive* terminal, and the positive leads (red-white) had been connected to the battery *negative* terminal. To prevent incorrect battery connections, the following precautionary procedures are recommended:

(1) Mark the battery terminals of the vehicular battery power cable so that the person that replaces the cable leads to the battery knows the positive power cable lead(s) and the negative power cable lead(s). The battery negative terminal can be identified by the fact that it is smaller than the positive battery terminal and it is connected to the vehicular chassis by a bonding strap.

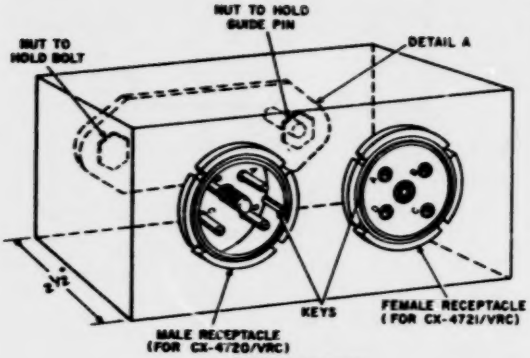
(2) Install Suppressor, Electrical MX-7778/GRC in the battery distribution circuit of the vehicle. Installation procedures are provided in TM 11-5195-223-15, which also covers maintenance of the suppressor. The MX-7778/GRC protects the vehicle from circuit overload (short circuit) in the radio (and intercom) equipment and the radio (and intercom) equipment from electrical transient voltages in the vehicle electrical system.

b. When trouble is suspected in the application of operating dc voltages to the receiver-transmitter that was used with the AM-2060(*)/GRC, check the AM-2060(*)/GRC output circuits by performing measurements of the output voltages and resistances at connector J2 (para 3-8, fig. 3-6).

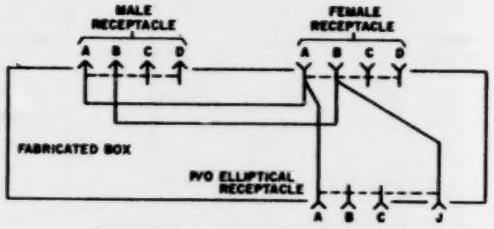
c. When trouble is suspected in the audio ampli-



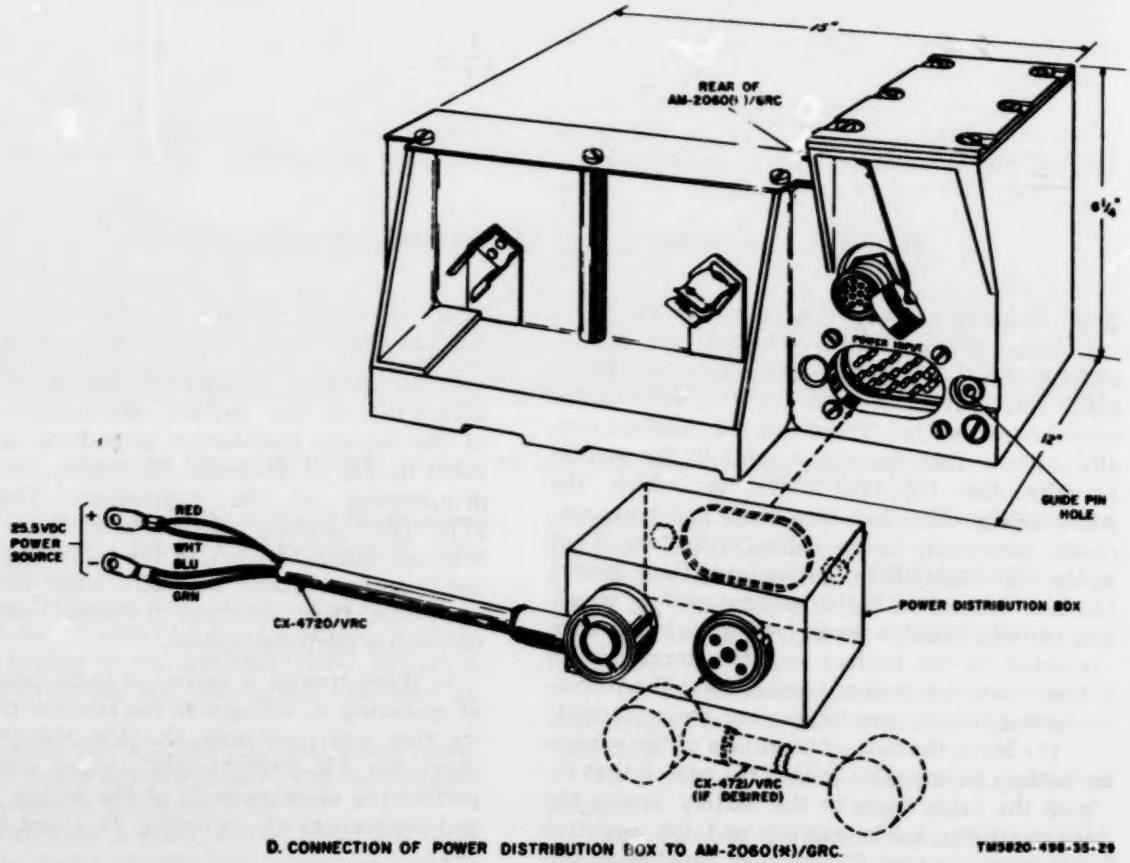
A. FRONT OF BOX.



B. REAR OF BOX.



C. DIAGRAM OF RECEPTACLES WIRING.



D. CONNECTION OF POWER DISTRIBUTION BOX TO AM-2060(*)/GRC.

TM5820-498-35-29

Figure 3-4. Fabrication and connection of power distribution box.

fier circuits, check the circuits of the audio amplifiers (para 3-9).

3-6. Troubleshooting Chart

The trouble symptoms listed in the following troubleshooting chart will aid in localizing and isolating troubles to a component part in the AM-2060(*)/GRC.

Item	Indication	Probable trouble	Procedure
1	Receiver-transmitter can be turned on when AM-2060(*)/GRC PWR switch is set to OFF.	AM-2060(*)/GRC was manufactured with wire (red) connected to pin B on POWER INPUT connector J3.	Change wiring at connector J3. Refer to note in figure 4-9 and to paragraph 3-16 for details.
2	No power is applied to receiver-transmitter when PWR switch is set to ON.	Defective CX-4655/GRC	Check for defective cable assembly (para 3-7).
		Defective PWR switch CB1	Check continuity of CB1.
		Defective POWER INPUT connector J3.	Make voltage and resistance measurements at J3 (para 3-8).
		Defective voltage regulator circuit	Check voltage regulator circuit (para 3-10).
3	Received signals are not heard at AM-2060(*)/GRC loudspeaker, but can be heard at crewmember control boxes.	Defective relay K1	Check continuity of contacts 8 and 2 between test points E12 and E14 (fig. 3-8).
		Defective SPKR switch S1	Check continuity of SPKR switch S1 between test points E12 and E14 (fig. 3-8).
		Defective loudspeaker LS1	Check continuity of loudspeaker between test points E1 and E13 (fig. 3-8).
4	Received signals are not heard at AM-2060(*)/GRC loudspeaker or crewmember control boxes.	Defective audio amplifier circuit	Inject a 1,000-Hz, 1-volt between test points E17 and ground. If no sound is heard from the loudspeaker, check the audio amplifier circuit (para 3-9).
		Defective POWER INPUT connector J3.	Make voltage and resistance measurements at J3 (para 3-8).
		Defective SET POWER connector J2.	Make voltage and resistance measurements at J2 (para 3-8).
5	Received signal can be heard from AM-2060(*)/GRC loudspeaker but not at crewmember control boxes.	Defective POWER INPUT connector J3.	Make voltage and resistance measurements at J3 (para 3-8).
6	Received signals are very weak	Defective voltage regulator circuit	Adjust R10 for correct output voltage (para 3-10c).
		Defective audio amplifier circuit	Check audio amplifier circuit (para 3-9).
7	In RT-505/PRC-25 only, no RF power output from receiver-transmitter in transmit mode, but receiver circuit operates normally.	Filament supply, 2.6 volts, circuit is open.	Check for 2.6 volts at test point E15 and ground (fig. 3-8).
8	Receiver-transmitter output reduced on any and all frequencies.	Defective ANT. FREQ. CONTROL switch S2.	Make voltage and resistance measurements at ANTENNA CONTROL connector J4 (para 3-8).
		Defective ANTENNA CONTROL connector J4.	Make voltage and resistance measurements at connector J4 (para 3-8).
		Defective voltage regulator circuit	Adjust R10 to correct output voltage (para 3-10c).

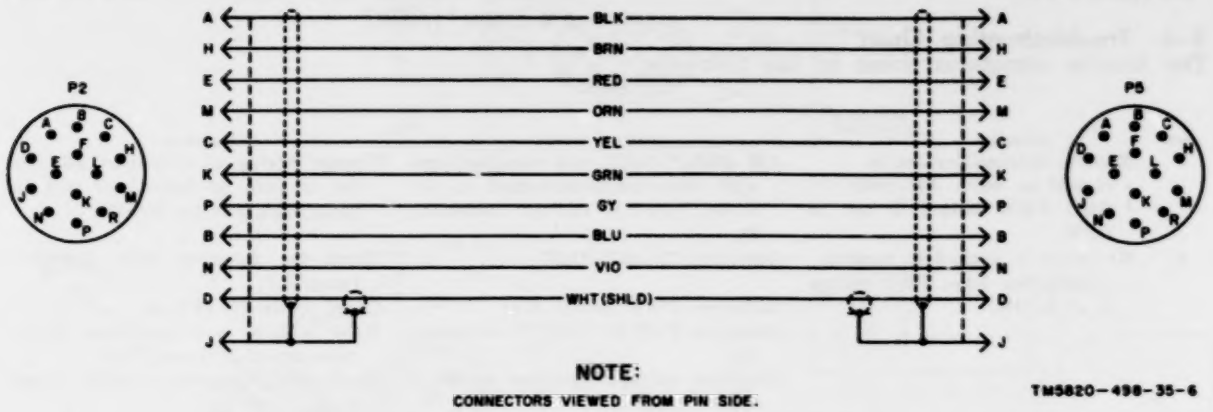


Figure 3-5. Cable Assembly, Special Purpose, Electrical CX-4655/GRC, wiring diagram.

3-7. Continuity and Short Circuit Tests for Cable Assembly, Special Purpose, Electrical CX-4655/GRC

Use Multimeter ME-26(*)/U as an ohmmeter to check for continuity and short circuits in CX-4655/GRC wires. Refer to figure 3-5 for the wiring diagram.

3-8. AM-2060(*)/GRC, Voltage and Resistance Measurements at Connectors J2, J3, and J4

To isolate trouble to a defective part in the AM-2060(*)/GRC, other than on the plug-in assembly, use the techniques given in *a* through *c* below. Use the schematic diagram (fig. 4-9) to trace and isolate the defective part.

a. Resistance Measurements. Before making resistance measurements, remove all power and cable connections to the AM-2060(*)/GRC. Refer to figure 3-6 for the required AM-2060(*)/GRC switch settings and resistance indications. Refer to *c* below for the resistance indications at all switch positions of the ANT. FREQ. CONTROL switch.

b. Voltage Measurements. To make voltage measurements, apply a 25.5-volt dc power source (or 25.2 volts from the PP-2953(*)/U) to POWER INPUT connector J3 (para 3-4). Refer to figure 3-6 for the required AM-2060(*)/GRC switch settings and voltage indications. Refer to *c* below fo the voltage indications at all positions of the ANT FREQ. CONTROL switch.

c. ANTENNA CONTROL Connector J4. Voltage (*b* above) and resistance (*a* above) indications at connector J4 for all positions of ANT. FREQUENCY CONTROL switch are provided in the following chart. The SPKR switch is set to OFF; the PWR switch is set to ON. The ME-26(*)/U measurements are made between J4 pins and ground.

ANT. FREQ. CONTROL position	ANTENNA CONTROL connector J4 pin connections [a] [b]																	
	A		B		C		D		E		F		H		J		N	
	volts	ohms	volts	ohms	volts	ohms	volts	ohms	volts	ohms	volts	ohms	volts	ohms	volts	ohms	volts	ohms
30-33	25.5	22	0	Inf	0	0	25.5	22	0	Inf	0	Inf	0	Inf	0	Inf	25.5	22
33-37	25.5	22	0	Inf	0	0	0	Inf	25.5	22	0	Inf	0	Inf	0	Inf	25.5	22
37-42	25.5	22	01	Inf	0	0	0	Inf	0	Inf	25.5	22	0	Inf	0	Inf	25.5	22
42-47.5	25.5	22	0	Inf	0	0	0	Inf	0	Inf	0	Inf	25.5	22	0	Inf	25.5	22
47.5-53	25.5	22	0	Inf	0	0	0	Inf	0	Inf	0	Inf	0	Inf	25.5	22	25.5	22
53-56	0	Inf	25.5	22	0	0	25.5	22	0	Inf	0	Inf	0	Inf	0	Inf	25.5	22
56-60	0	Inf	25.5	22	0	0	0	Inf	25.5	22	0	Inf	0	Inf	0	Inf	25.5	22
60-65	0	Inf	25.5	22	0	0	0	Inf	0	Inf	25.5	22	0	Inf	0	Inf	25.5	22
65-70.5	0	Inf	25.5	22	0	0	0	Inf	0	Inf	0	Inf	25.5	22	0	Inf	25.5	22
70.5-76	0	Inf	25.5	22	0	0	0	Inf	0	Inf	0	Inf	0	Inf	25.5	22	25.5	22

[a] Volts indication obtained should be same as supplied from dc power source (*b* above).
[b] "Inf" indicates infinite resistance (open circuit).

AM-2060(*)/GRC, Isolating Troubles in Audio Amplifiers Q1 and Q2

trouble has been localized to audio ampli- Q1 and Q2, use the following procedures late the defective part in the circuit.
The following equipment is required:
1) A 25.5-volt dc power source (or 25.2-volt t of Power Supply PP-2953(*)/U).
2) Generator, Signal AN/URM-127.
3) Voltmeter, Electronic ME-30(*)/U.
4) Receive dummy load assembly (para fig. 3-1).
Remove the access plate (fig. 3-10) from the the AM-2060(*)/GRC to gain access to the oints E1 through E22 on the plug-in assem- ig. 3-11 and 3-15).
Connect the receive dummy load assembly to POWER connector J2 (fig. 3-7).
Connect the dc power source (*a*(1) above) to A (chassis ground) and J of POWER INPUT ctor J3 (fig. 3-7).
Set the PWR and SPKR switches to ON.
Apply a 1-kHz, 1-volt signal from the URM-127 with its adapter UG-514/U to pins hassis ground) and B of SET POWER ctor J2 (fig. 3-7).
When the ME-30(*)/U is connected between E1 and E14 of the plug-in-assembly (fig.3-9), ould indicate 4.5 ±0.10 volts ac. If the 30(*)/U indication is not approximately 4.5 ac, make voltage and resistance measure- s of the audio amplifier circuit and also the ge regulator circuit.
1) To make the voltage measurements, leave c power connected to connector J3 (*d* above) nake the voltage measurements at the pins of lug-in assembly (fig. 3-9).
2) To make the resistance measurements, ve the dc power from connector J3, and make esistance measurements at the pins of the in assembly.
3) Refer to paragraph 3-11 for dc resist- of transformers and coils involved in the its.

). AM-2060(*)/GRC, Adjustment of R10, and Isolating Troubles in Voltage Regulator Circuits Q3 and Q4

n trouble has been localized to voltage regula- Q3 and Q4, use the following procedures to te the defective part in the circuit.
Equipment Required.
(1) A 25.5-volt dc power source (or 25.2- output of Power Supply PP-2953(*)/U).
(2) Multimeter ME-26(*)/U.
(3) Transmit dummy load assembly (para 3-3*e*, fig. 3-1).

b. Test Setup.

(1) Remove the access plate (fig. 3-10) from the top of the AM-2060(*)/GRC to gain access to the test points E1 through E22 on the plug-in assembly (fig. 3-9).

(2) Connect the transmit dumm load assembly to SET POWER connector J2 (fig. 3-8).

(3) Connect the dc power source (*a*(1) above) to pins A (chassis ground and J of POWER INPUT connector J3 (fig. 3-8).

(4) Set the PWR switch to ON.

c. Output Voltage Adjustments, R10.

(1) Perform the test setup given in *b* above.

(2) Connect the ME-26(*)/U, arranged as a dc voltmeter, between pins E (positive) and A (chassis ground) (14.5-ohm load resistor) of SET POWER connector J2 (fig. 3-8).

(3) Loosen the locknut holding the adjustment screw of R10 (fig. 3-11).

NOTE

If the locknut cannot be easily loosened, use a drop of penetrating oil on the threads and allow it to penetrate before trying to loosen the locknut.

(4) Adjust R10 adjustment screw for an indication of +13 volts on the ME-26(*)/U. Fingertighten the locknut holding the control.

d. Isolating Troubles in Voltage Regulator Circuit Q3 and Q4.

(1) Perform the test setup and adjustment procedures given in *b* and *c* above before proceeding.

(2) Measure the voltage drop across reference diode CR1 by placing the ME-26(*)/U negative lead on test point E1 and the positive test lead on test point E6 (fig. 3-9). The ME-26(*)/U should indicate approximately 6.8 volts dc.

(3) Measure the voltage drop across reference diode CR2 by placing the ME-26(*)/U negative lead on test point E3 and the positive test lead on test point E4. The ME-26(*)/U should indicate approximately 6.8 volts dc.

(4) If the voltage indication obtained across CR1 and CR2 is still not within limits, make voltage and resistance measurements of the voltage regulator circuits to determine the defective part.

3-11. Dc Resistance of Transformers and Coils

The dc resistance of the transformer windings and the relay coil on the plug-in assembly of the AM-2060(*)/GRC are listed in the following chart.

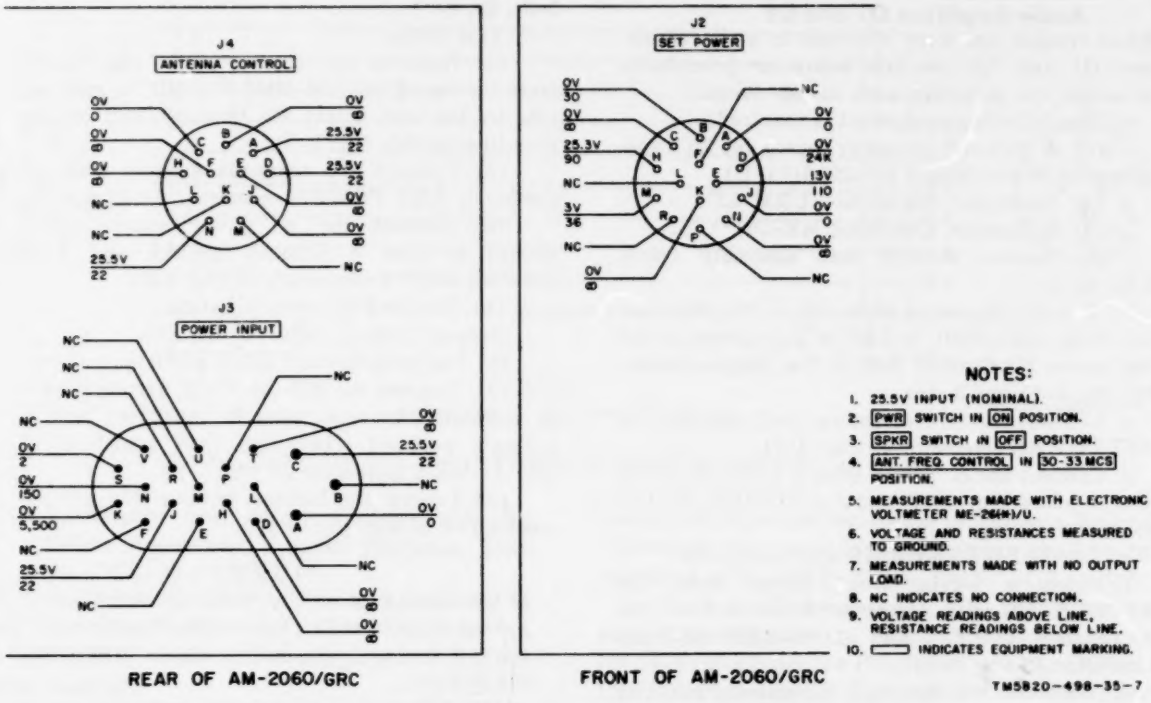

J4
ANTENNA CONTROL
J3
POWER INPUT
REAR OF AM-2060/GRC
J2
SET POWER
FRONT OF AM-2060/GRC
NOTES:
1. 25.5V INPUT (NOMINAL).
2. PWR SWITCH IN ON POSITION.
3. SPKR SWITCH IN OFF POSITION.
4. ANT. FREQ. CONTROL IN 30-33 MCS POSITION.
5. MEASUREMENTS MADE WITH ELECTRONIC VOLTMETER ME-26(*)/U.
6. VOLTAGE AND RESISTANCES MEASURED TO GROUND.
7. MEASUREMENTS MADE WITH NO OUTPUT LOAD.
8. NC INDICATES NO CONNECTION.
9. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE.
10. INDICATES EQUIPMENT MARKING.
TM5820-498-35-7

Figure 3-6. AM-2060(*)/GRC, front and rear panel connectors J2, J3, and J4, voltage and resistance indications.

NOTE

Make all resistance measurements with the plug-in assembly removed from the AM-2060(*)/GRC (para 3-13*a*).

Component (fig. 3-14)	*Terminals*	*Test points (fig. 3-9)*	*Resistance (ohms)*	
T1	1-2	E17 to E1	30	or 46
	3-5	E19 to E20	30	or 18
	3-4	E2 to E20	15	or 9
	4-5	E2 to E19	15	or 9
T2	1-3	E18 to E21	8	or 16
	1-2	E1 to E18	4	or 8
	2-3	E1 to E21	4	or 8
	4-6	E1 to E16	1.2	or 2.5
	5-6	E14 to E16	.8	or 1.5
	4-5	E1 to E14	.4	or 1.0
K1	1-5	Pins 9 and 12 of P1 (fig. 3-13)	320.0	

Note. Added resistance values obtained from T1, T2 wound differently original T1, T2 cores.

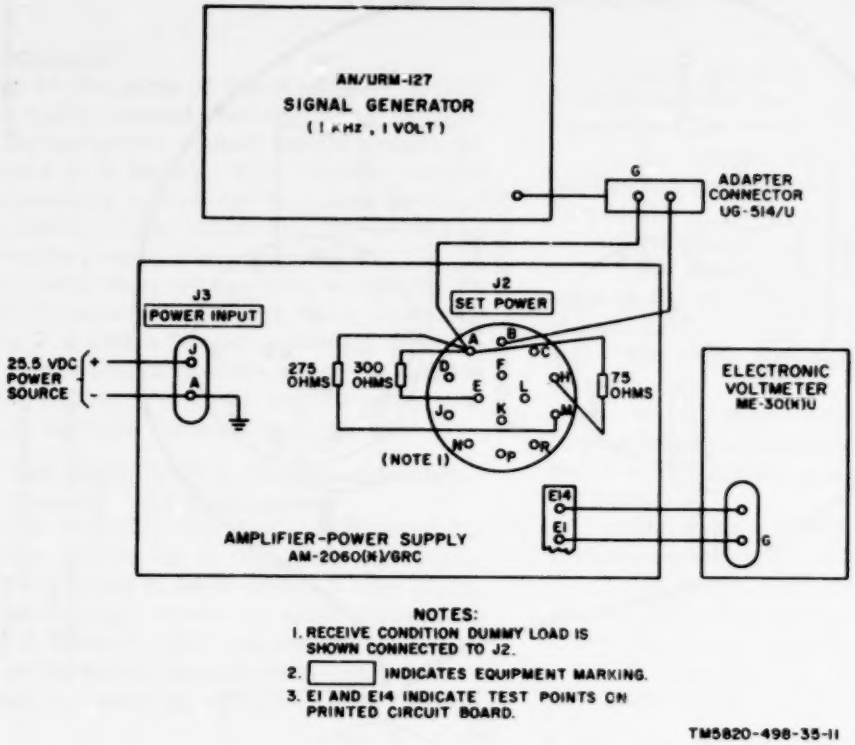


Figure 3–7. Test setup for isolating trouble in audio amplifiers Q1 and Q2.

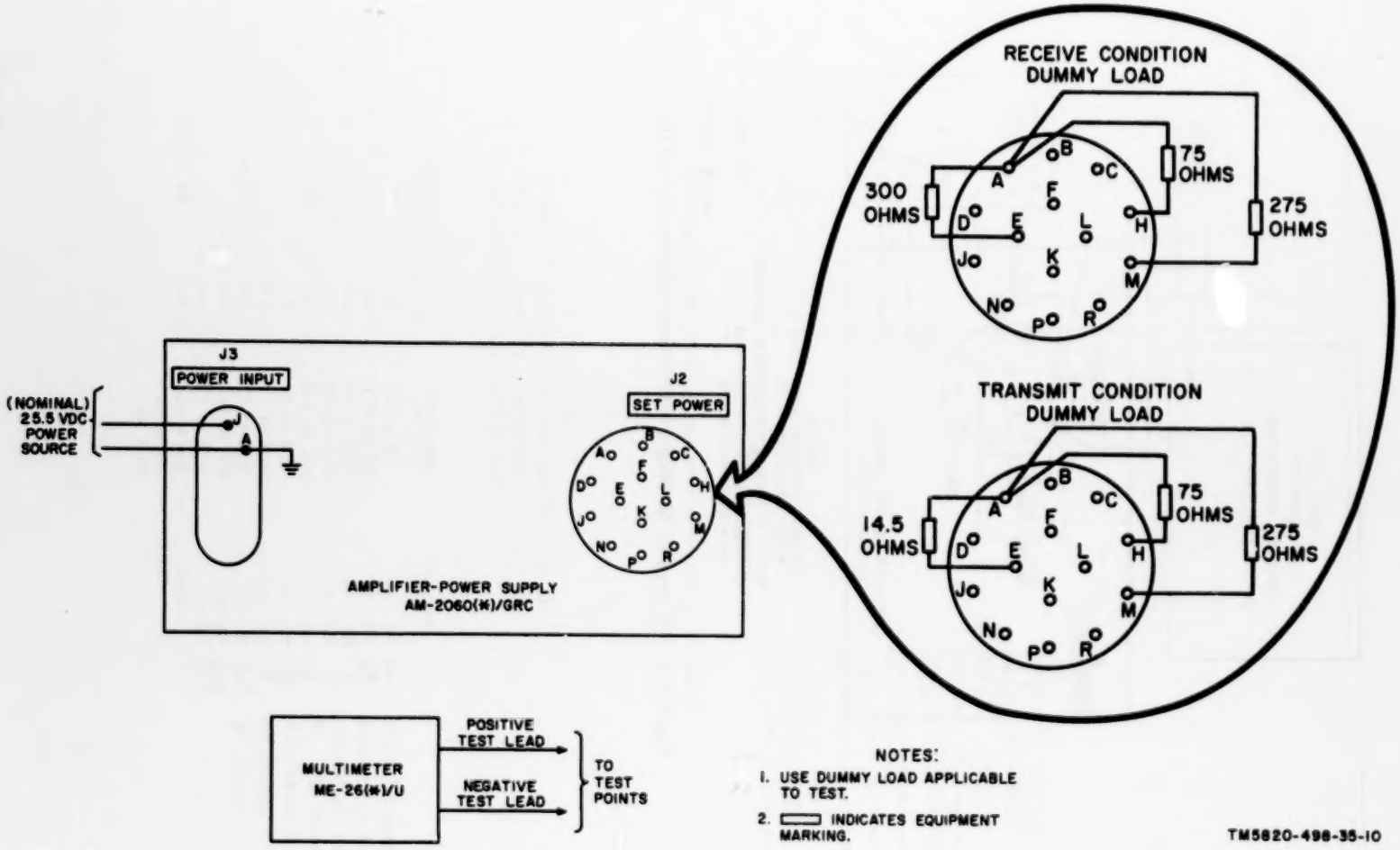


Figure 3-8. Test setup for isolating troubles in voltage regulators Q3 and Q4.

Section III. OA-3633(*)/GRC, PARTS REMOVAL AND REPLACEMENT PROCEDURES

3-12. General

a. Most of the parts of the AM-2060(*)/GRC may be easily reached, removed, and replaced within the equipment without special procedures. Paragraphs 3-13 through 3-15 contain removal and replacement procedures for those parts of the AM-2060(*)/GRC which are not obvious or which require precautionary procedures.

b. No special tools are required, except that in removing transistors and diodes, use a pencil-type soldering iron with a 25-watt maximum capacity. With a pair of long-nose pliers, grasp the lead between the transistor or diode and the solder connection to dissipate the soldering iron heat.

3-13. AM-2060(*)/GRC, Plug-In Assembly, Removal and Replacement

The plug-in assembly (fig. 3-11) is removed for performing repairs on it (fig. 3-13 and 3-14), and to gain access to parts under it (fig. 3-12). Before proceeding, remove all cable connections to the AM-2060(*)/GRC and remove the access plate from the top of the equipment (fig. 3-10).

a. Plug-In Assembly, Removal and Replacement.

(1) *Removal.*

(*a*) Remove the four captive screws that hold the plug-in assembly to the chassis (fig. 3-11).

(*b*) Grasp the plug-in assembly and pull the assembly straight up and out of the equipment.

(2) *Replacement.*

(*a*) Insert the plug-in assembly so that the plug on the bottom of the assembly mates with the receptacle J1 on the bottom of the AM-2060(*)/GRC (fig. 3-12).

(*b*) Tighten the four captive screws on the plug-in assembly (fig. 3-11). Make sure that the plug-in assembly is not loose.

(*c*) Replace the access plate on top of the AM-2060(*)/GRC.

b. Plug-In Assembly Printed Circuit Board, Removal and Replacement. Use the following procedures to remove and replace the printed circuit board of the plug-in assembly.

(1) *Removal.*

(*a*) Remove the plug-in assembly (*a*(1) above).

(*b*) Unsolder the wires attached to test points E1 through E17 (fig. 3-9) on the top of the plug-in assembly. Tag each wire with the identification of the terminal from which it was removed.

(*c*) Remove the screws, nuts, and spacers that secure the printed circuit board to the plug-in assembly.

(2) *Replacement* (fig. 3-15).

(*a*) Insert a screw and washer through each of the four mounting holes of the printed circuit board.

(*b*) Place a spacer over each of the four screws.

(*c*) Align the mounting holes of the plug-in assembly with the screws in the printed circuit board and insert the screws through the mounting holes.

(*d*) Place a washer and nut on each of the four screws and tighten the nut securely.

(*e*) Solder the wires to test points E1 through E17 (fig. 3-9). Check each wire tag to insure the correct replacement.

(*f*) Replace the plug-in assembly in the AM-2060(*)/GRC (*a*(2) above).

3-14. AM-2060(*)/GRC, Loudspeaker LS1, Removal and Replacement (fig. 3-16)

The loudspeaker is removed from the front panel for testing and replacement, or to gain access to the area behind it. Before proceeding, remove all cable connections.

a. Removal.

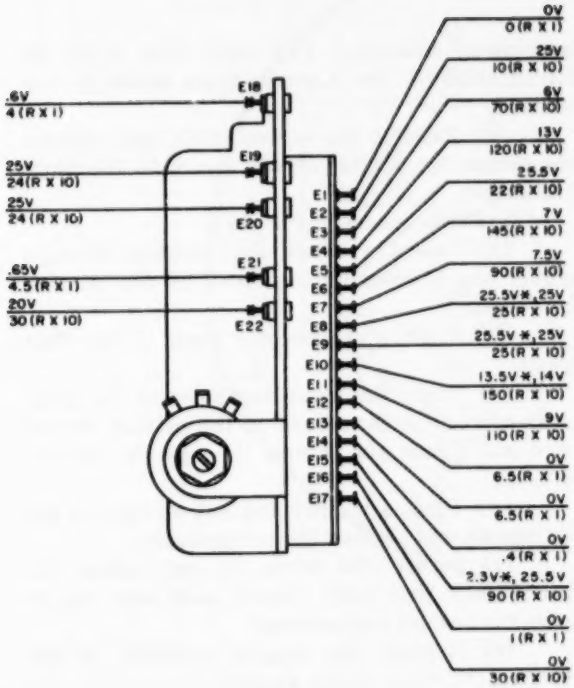
(1) Remove the four mounting screws that attach the loudspeaker cover with the loudspeaker attached to the front of the AM-2060(*)/GRC. Place the nylon strap attached to the SET POWER connector dust cap clear of the loudspeaker area.

(2) Grasp the front of the loudspeaker cover and pull the loudspeaker cover from the loudspeaker by holding LS1 firmly and snapping the cover off.

WARNING

When soldering and unsoldering the voice coil leads, be careful to prevent the glass portion of the terminals from cracking due to excessive heat. Grasp the terminal lead with a pair of pliers, between the glass bead and the eye of the terminals, before applying heat.

(3) Unsolder the leads that connect the voice coil of LS1 to the feedthrough terminals at the



NOTES:

1. 25.5-VOLT INPUT (NOMINAL).
2. PWR SWITCH IN ON POSITION.
3. SPKR SWITCH IN OFF POSITION.
4. ANT. FREQ. CONTROL IN 30-33 MCS POSITION.
5. MEASUREMENTS MADE WITH MULTIMETER ME-26(*)/U.
6. VOLTAGES AND RESISTANCES MEASURED TO GROUND.
7. MEASUREMENTS MADE IN TRANSMIT CONDITION OF RCVR-XMTR.
8. * INDICATES MEASUREMENT IN RECEIVE CONDITION OF RCVR-XMTR.
9. VOLTAGE READINGS ABOVE LINE, RESISTANCE READINGS BELOW LINE.
10. (R X 1) OR (R X 10) INDICATES METER RANGE OF ME-26(*)/U USED FOR RESISTANCE MEASUREMENT.

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Figure 3-9. AM-2060(*)/GRC, plug-in assembly, test points with voltage and resistance indications.

voice coil terminals. Tag the leads (VC1 or VC2) to insure correct replacement. Remove LS1. See *c* below for testing the polarity of the loudspeaker magnet.

b. Replacement.

(1) Place the loudspeaker cover on a new LS1 by holding LS1 firmly and snapping the cover in place. Check to insure that the mounting holes in the cover align with the mounting holes in LS1.

(2) Solder the leads that come from the feedthrough terminals VC1 and VC2.

(3) Place LS1 in the loudspeaker cavity. Check to insure that the mounting holes in the loudspeaker cover and LS1 align with the mounting holes in the front of the AM-2060(*)/GRC.

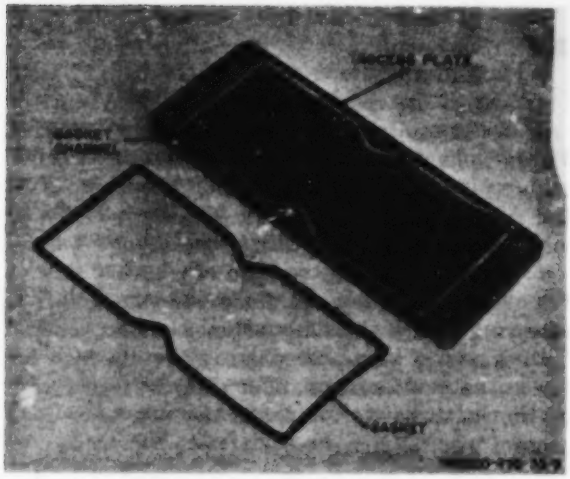


Figure 3-10. AM-2060(*)/GRC, access plate and gasket.

(4) Replace the mounting screws and nylon strap.

c. Testing Voice Coil Polarity. When a 4.5 ±1.5 volt dc potential is connected to the voice coil terminals, with the positive polarity applied to the terminal next to the red mark, the voice coil shall move in a direction away from the magnet.

3-15. AM-2060(*)/GRC, ANT. FREQ. CONTROL Switch S2, Removal and Replacement

(fig. 3-12 and 3-16)

a. Removal.

(1) Remove the access plate from the top of the AM-2060(*)/GRC.

(2) Set the ANT. FREQ. CONTROL to 30-33 position.

(3) Remove the knob retaining screw (A, fig. 3-16). Remove the switch knob from the switch shaft.

(4) Remove the nut that secures the switch to the front panel.

(5) Slide switch S2 back into the compartment. Do not exert too much force or push the switch back too far; the leads may break.

(6) Hold the *replacement* switch in th *exact* position as the original switch, remove th connecting wires and capacitors C1 through C7 (fig. 3-12) from the original switch, one at a time, and connect them to the corresponding contact on the replacement switch.

b. Replacement.

(1) Replace the switch shaft through the opening in the front panel.

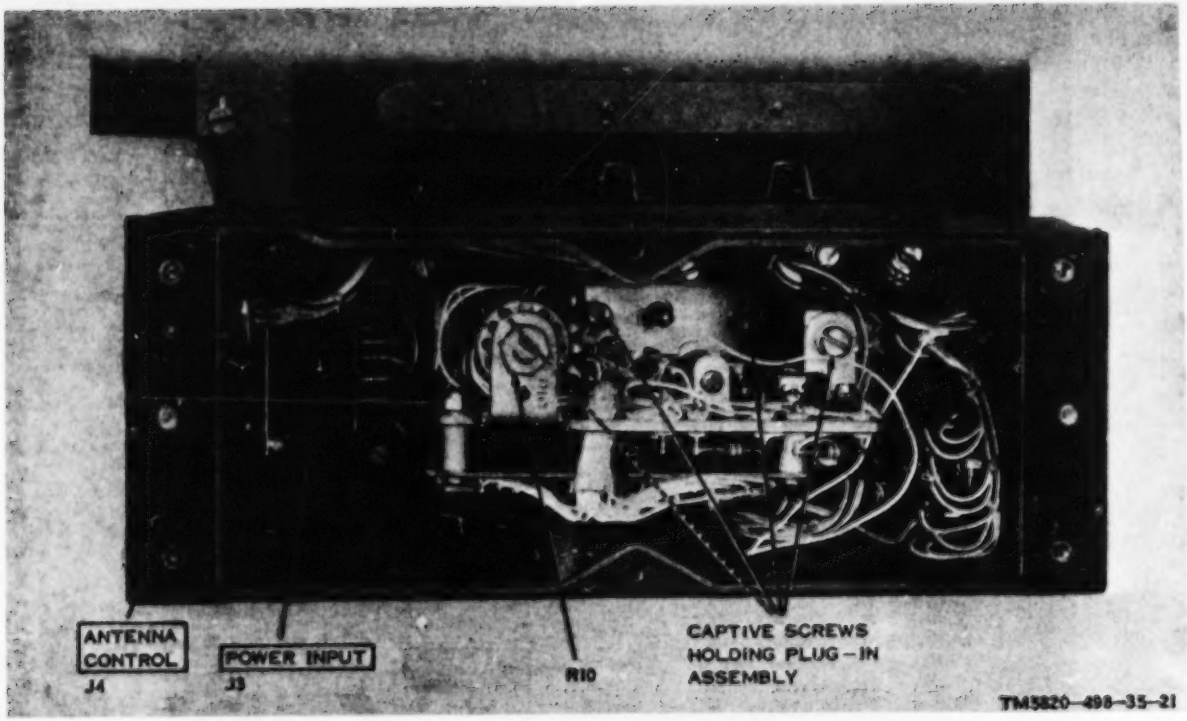


Figure 3-11. AM-2060(*)/GRC, top view with plug-in assembly in place.

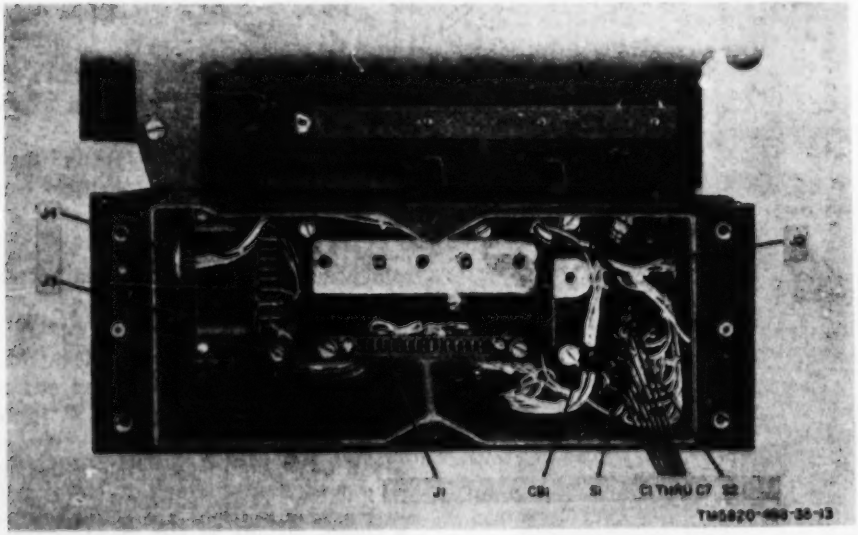


Figure 3-12. AM-2060(*)/GRC, top view with plug-in assembly removed.

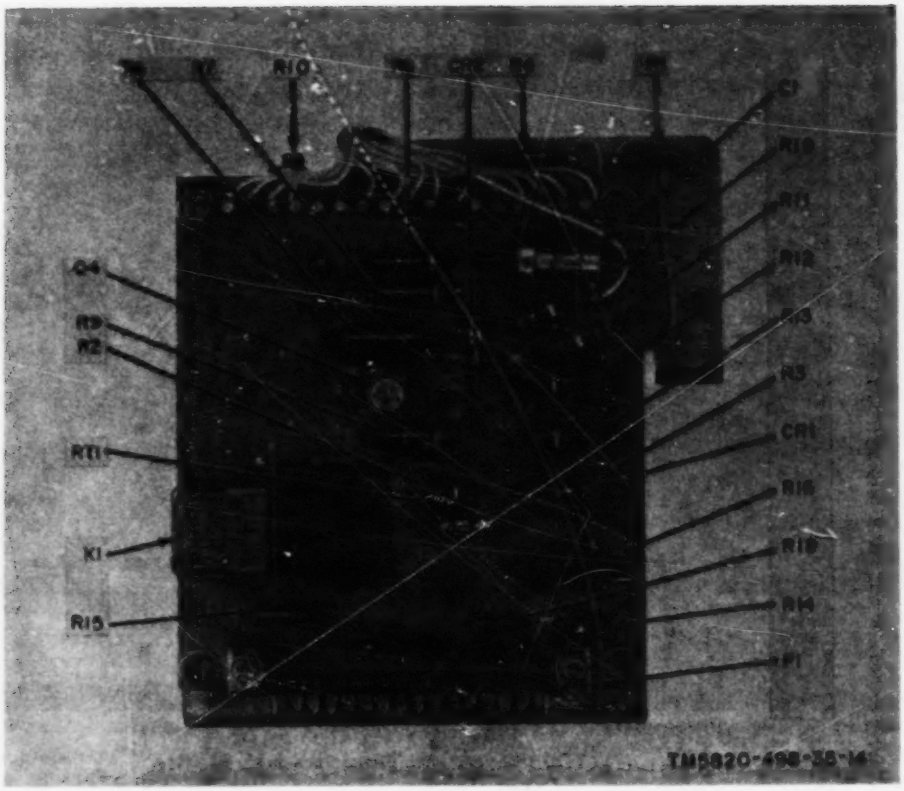


Figure 3-13. AM-2060(*)/GRC, plug-in assembly front view, parts location.

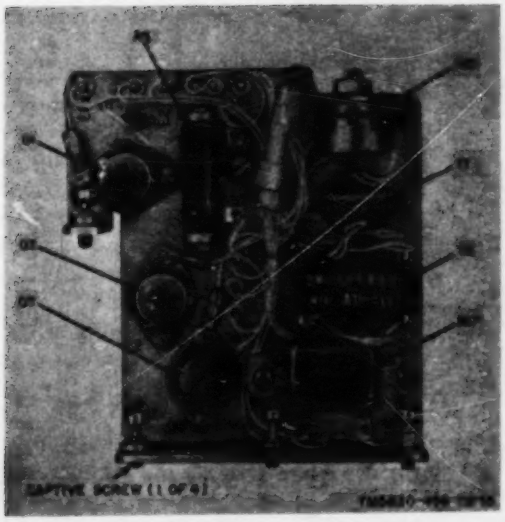


Figure 3-14. AM-2060(*)/GRC, plug-in assembly, rear view, parts location.

(2) Rotate the switch shaft so that the knob will be in the proper position when it is replaced on the shaft.

(3) Replace and tighten the nut; hold the switch in the proper position until the nut is tightened.

(4) Replace the knob on the switch shaft, and secure it in place with the retaining screw.

3-16. Rewiring POWER INPUT Connector J3

AM-2060(*)/GRC's on Orders No. 15108-PP-62 and 5175-PP-64 were wired incorrectly at POWER INPUT connector J3 (note 10, fig. 4-9). Tests to determine the faulty equipment are given in *a* below; rewiring instructions are given in *b* below. If the equipment is wired incorrectly a closed circuit to the dc vehicular dc power ex ists even when the AM-2060(*)/GRC PWR switch is set to OFF.

a. Tests. When the AM-2060(*)/GRC PWR switch is set to OFF, the associated receiver-transmitter should not be able to be turned on. However, when the AM-2060(*)/GRC is wired

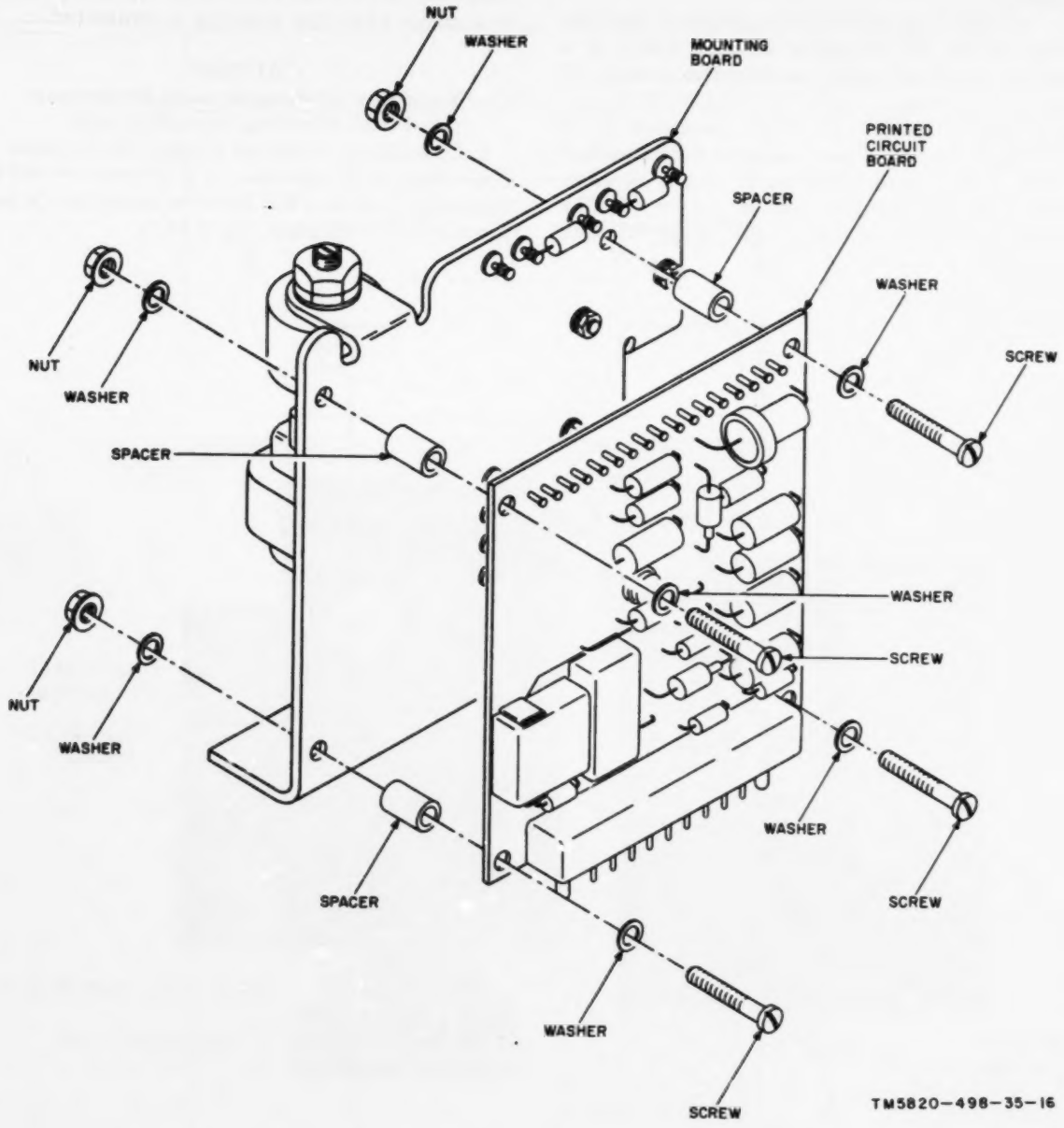


Figure 3-15. AM-2060(*)/GRC, plug-in assembly, exploded view.

incorrectly at J3, the receiver-transmitter can be turned on even when the PWR switch is set to OFF. If any of the following tests indicates the wiring is incorrect, proceed to the rewiring procedures in *b* below.

(1) *Method No. 1.* Set the AM-2060(*)/GRC PWR switch to OFF and connect an ohmmeter between pins A and B of POWER INPUT connector J3 (D, fig. 3-4). If the ohmmeter indicates continuity, J3 wiring is incorrect.

(2) *Method No. 2.* Connect the AM-2060(*)/GRC to a dc power source (para 3-4). Use the CX-4655/GRC to connect a receiver-transmitter to the AM-2060(*)/GRC. Set the AM-2060(*)/GRC PWR switch to OFF.

(*a*) Set the receiver-transmitter function

switch to LITE. If the dial map lights, J3 wiring is incorrect.

(*b*) Set the receiver-transmitter function switch to ON. If a rushing noise is heard in a handset connected to the receiver-transmitter, J3 wiring is incorrect.

b. Rewiring INPUT POWER Connector J3. If any of the tests performed in *a* above indicates that J3 wiring is incorrect, rewire the leads at J3 to conform to the circuit shown in figure 4-9. The incorrect wiring at J3 is shown in figure 4-9, note 10. To facilitate the work, remove the plug-in assembly (para 3-13). Perform the operational test in *a* above when the rewiring is completed.

CAUTION

Make sure all changed wires are properly taped with electrical insulation tape.

c. Installation of Zener Diode CR1 in place of Capacitor C8. If capacitor C8 is defective it will be replaced by diode CR1. Remove capacitor C8 and install CR1 in its place (fig. 3-16.1).

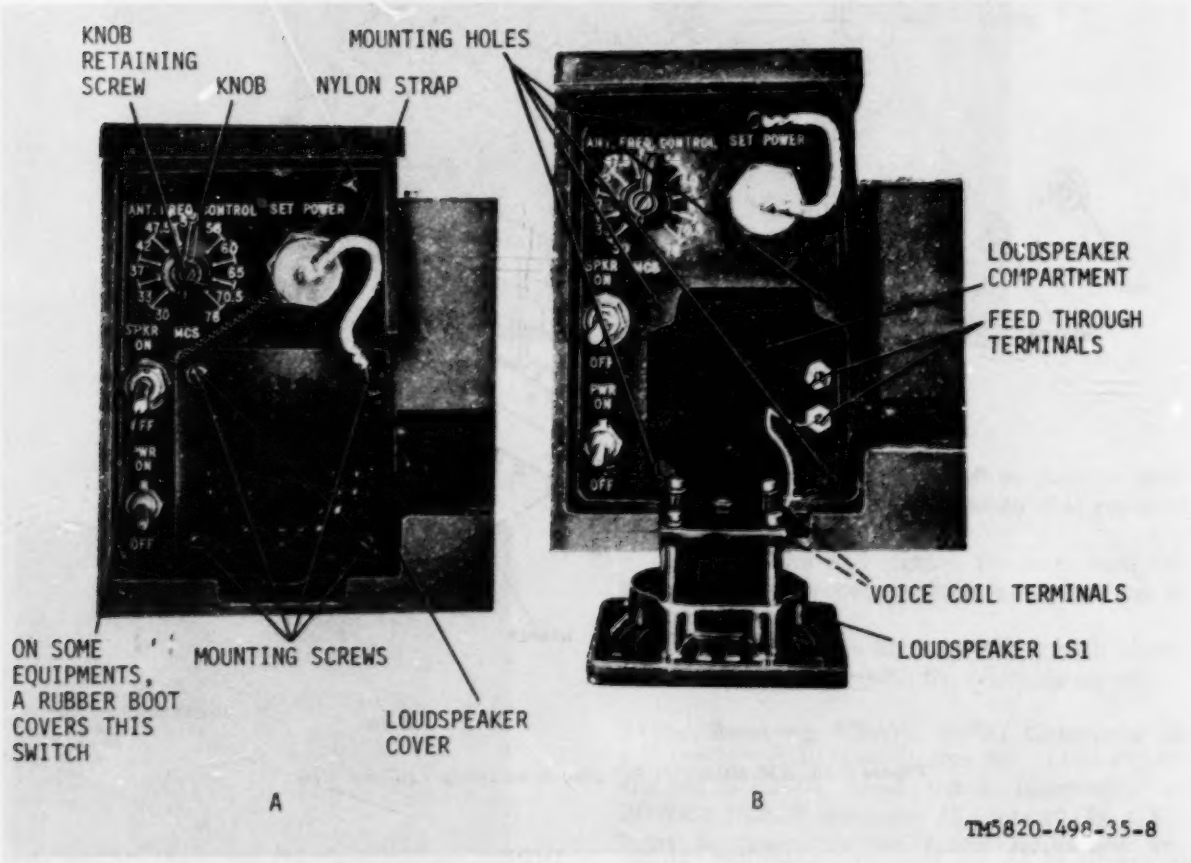
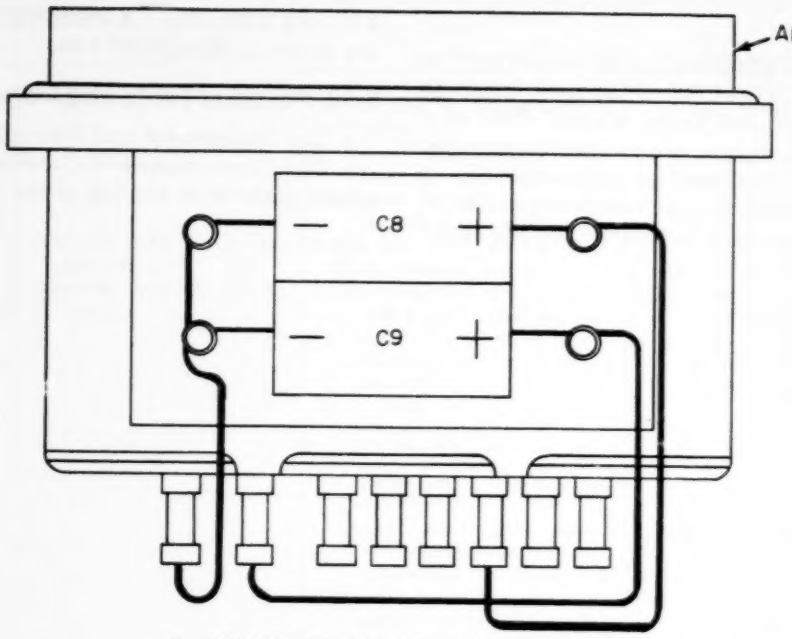
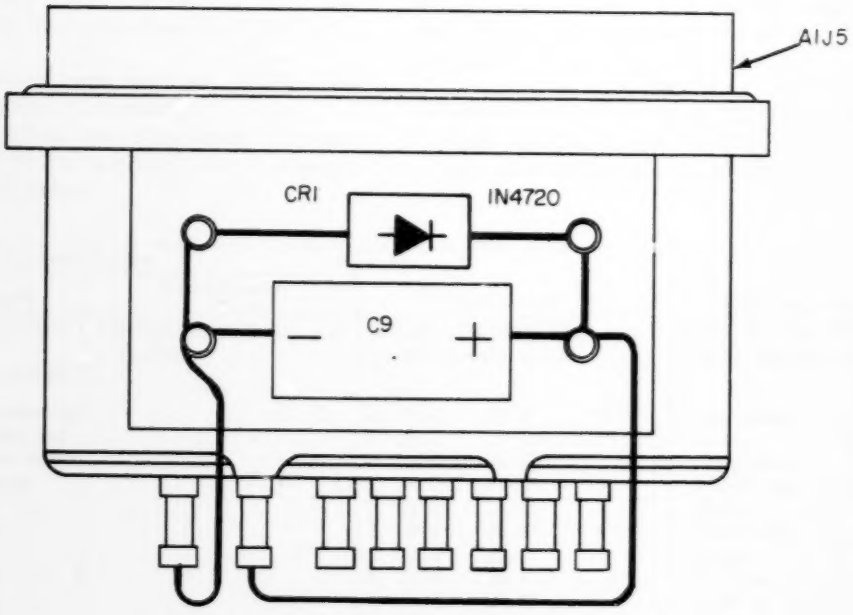


Figure 3-16. AM-2060(*), front panel, parts location.



A. WIRING OF CONNECTOR ASSEMBLY J3 WITH CAPACITORS C8 AND C9



B. WIRING OF CONNECTOR ASSEMBLY J3 WITH CAPACITOR C9 AND DIODE CR1

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Figure 3-16.1. Installation of diode CR1.

Section IV. OA-3633(*)/GRC, TESTING PROCEDURES

3-17. General

Before a repaired AM-2060(*)/GRC is returned to the using organization, or to stock, it must be tested for acceptable performance. The AM-2060(*)/GRC performance checks include physical tests (para 3-18), and testing the continuity of circuits (para 3-19), dc output voltages (para 3-20), and the audiofrequency amplifier circuits (para 3-21 and 3-22). The CX-4655/GRC test procedures are given in paragraph 3-23.

3-18. Physical Tests and Inspection

a. Test Equipment and Material. None.

b. Test Connections and Conditions. Remove the access plate from the top of the AM-2060(*)/GRC.

c. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	N/A	Controls may be in any position.	*a.* Inspect all controls for loose or missing screws, bolts, or nuts.	*a.* Screws, bolts, and nuts are tight; none are missing.
			b. Inspect all connectors for looseness or damage.	*b.* No looseness or damage is evident.
			c. Inspect the plug-in assembly for looseness and damage.	*c.* No looseness or damage is evident.
2	N/A	Controls may be in any position.	Rotate the ANT. FREQ. CONTROL to each position.	ANT. FREQ. CONTROL has detent action for each position.
3	N/A	Controls may be in any position.	*a.* Examine exterior surfaces of AM-2060(*)/GRC for damage, missing parts and condition of finish and lettering. *Note.* Touchup painting is recommended in lieu of refinishing whenever practicable. Screwheads, receptacles, and plated fastener parts will not be painted or polished with abrasives.	*a.* No damage or missing parts are evident. External surfaces intended to be painted do not show bare metal. Lettering is legible.
			b. Inspect access plate gasket for excessive age, wear, and appearance of drying out.	*b.* Excessive age and wear are not evident.
			c. Inspect screw-type mounting clamps for damage or missing parts.	*c.* No damage or missing parts are evident.

3–19. Circuit Continuity and Resistance

The following tests check the circuits that are not involved in the tests in paragaphs 3–20, 3–21, and 3–22.

a. Test Equipment and Materiel. Multimeter ME–26(*)/U, used as an ohmmeter.

b. Test Connections and Conditions. Connect the ME–26(*)/U to the indicated pins on the receptacles given in *c* below.

c. Procedure. In the following procedures "J3–C", "J2–A", etc., indicate the receptacle and the pins on the receptacle: receptacle J3, pin C; receptacle J2, pin A, etc.

NOTE

SET POWER receptacle J2 is on the front panel (fig. 3–17) and POWER INPUT receptacle J3 is on the rear panel (fig. 3–4).

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
	ME–26(*)/U FUNCTION: OHMS RANGE: as required for resistance indication; zero meter for each range.	Controls may be in any position.	Connect ME–26(*)/U to indicated receptacle pins:	(Continuity: less than 1 ohm; Open: infinite resistance.)
			From — *To*	
			a. J2–C — J3–H	*a.* Continuity.
			b. J2–C — J2–A	*b.* Open.
			c. J2–J — J2–A	*c.* Continuity.
			d. J2–D — J3–N	*d.* 22,000 ohms ±10 percent.
			e. J2–D — J2–K	*e.* Open.
			f. J3–T — J2–K	*f.* Continuity.
			g. J3–T — J3–C	*g.* Open.
			h. J2–H — J3–C	*h.* 65 ohms ±10 percent.
			i. J3–K — J3–S	*i.* 5,600 ohms ±10 percent.
			j. J3–A — J2–A	*j.* Continuity.
			k. J3–A — J3–D	*k.* Open.
			l. J3–A — J3–N	*l.* 150 ohms ±10 percent.
			m. J3–A — J4–C	*m.* Continuity.

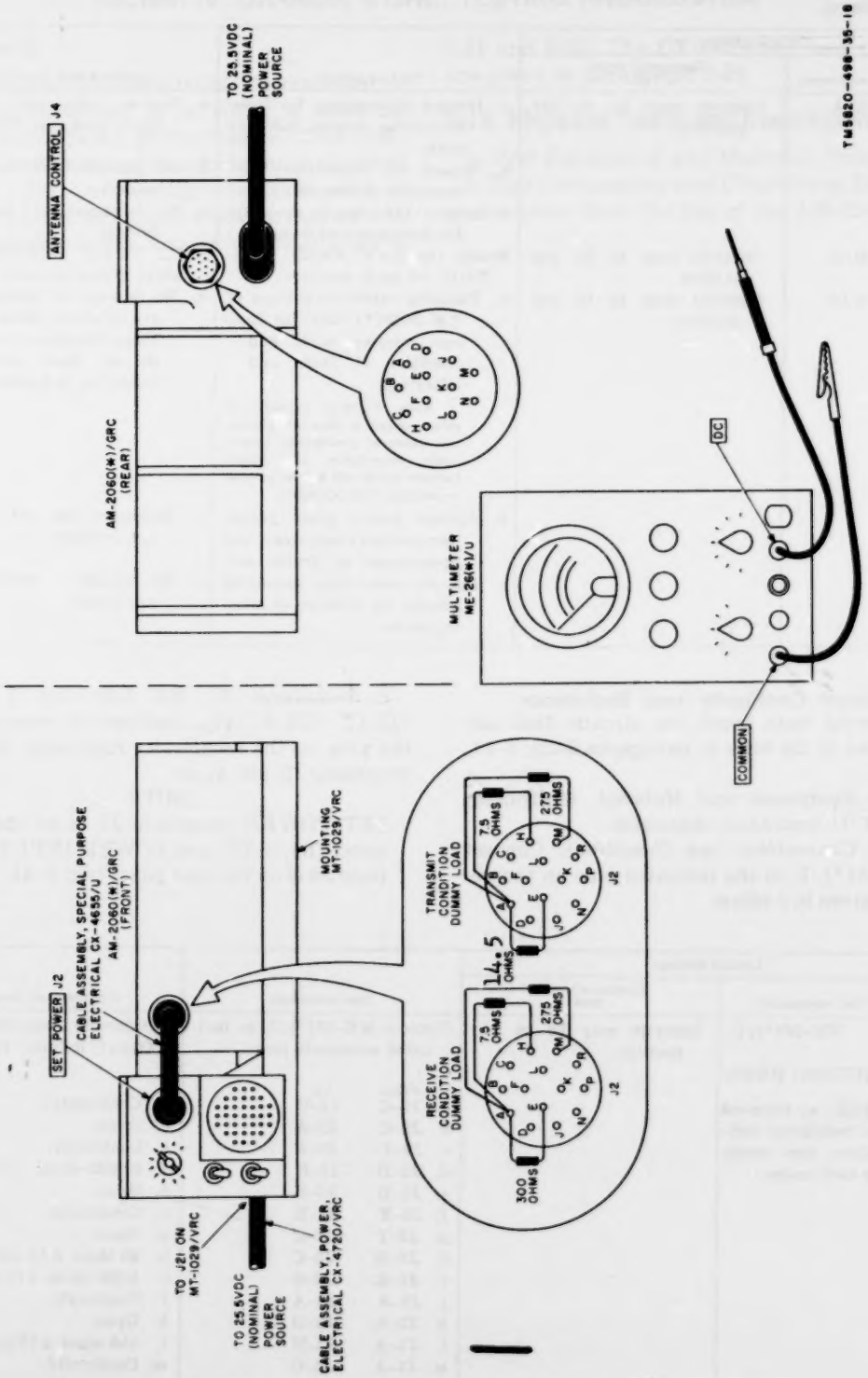


Figure 3-17. AM-2060(*)/GRC, test setup for output voltages tests.

3-20. Output Voltages Tests

a. Test Equipment and Materials.

(1) Multimeter ME-26(*)/U.
(2) Mounting MT-1029/VRC.
(3) Power Supply PP-2953(*)/U, or equal.
(4) Cable Assembly, Power, Electrical CX-4720/VRC.
(5) Transmit and receive dummy load assemblies.

b. Test Connections and Conditions. Connect the equipment as shown in figure 3-17. Turn the equipmen on, and allow it to warm up for 5 minutes before proceeding.

c. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	*ME-26(*)/U* FUNCTION switch: + RANGE switch: 30V	PWR switch: ON SPKR switch: OFF ANT. FREQ. CONTROL switch: any position	*a.* Connect the receive dummy load assembly to the SET POWER receptacle.	*a.* None.
			b. Connect the ME-26(*)/U COMMON lead to pin A on the receive dummy load assembly.	*b.* None.
			c. Connect the ME-26(*)/U DC probe pin E of the assembly.	*c.* The ME-26(*)/U should indicate +13 volts dc (readjust R10, para 3-10*c*).
			d. Set the ME-26(*)/U RANGE switch to 10V and zero the meter.	*d.* None.
			e. Connect the ME-26(*)/U DC probe to pin H of the assembly.	*e.* The ME-26(*)/U should indicate +2.6 ±0.3 volts dc.
			f. Connect the ME-26(*)/U DC probe to pin M of the assembly.	*f.* The ME-26(*)/U should indicate +3 ±0.3 volts dc.
			g. Remove the receive dummy load assembly from the AM-2060(*)/GRC receptacle.	*g.* None.
2	Same as step 1	Same as step 1	*a.* Connect the transmit dummy load assembly to the SET POWER receptacle.	*a.* None.
			b. Connect the ME-26(*)/U COMMON lead to pin A on the transmit dummy load assembly.	*b.* None.
			c. Connect the ME-26(*)/U DC probe to pin E of the assembly.	*c.* The ME-26(*)/U should indicate +13 volts dc ±0.5.
			d. Set the ME-26(*)/U RANGE switch to 10V and zero the meter.	*d.* None.
			e. Connect the ME-26(*)/U DC probe to pin H of the assembly.	*e.* The ME-26(*)/U should indicate +2.6 ±0.3 volts dc.
			f. Connect the ME-26(*)/U DC probe to pin M of the assembly.	*f.* The ME-26(*)/U should indicate +3 ±0.3 volts dc.
3	*ME-26(*)/U* FUNCTION switch: +	PWR switch: ON SPKR switch: OFF	*a.* Connect the ME-26(*)/U COMMON lead to the shell of the ANTENNA CONTROL receptacle.	*a.* None. *Note.* If the PP-2953(*)/U is used, the following 25.5-volt indications should be 25.2 volts.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
	RANGE switch: 100V (zero meter)			
			b. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL 30–33 MCS. Connect the ME-26(*)/U DC probe to pins A, D, and N of the receptacle.	*b.* 25.5 volts on pins A, D, and N.
			c. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 33–37 MCS. Connect the ME-26(*)/U DC probe to pins A and E of the receptacle.	*c.* 25.5 volts on pins A and E.
			d. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 37–42 MCS. Connect the ME-26(*)/U DC probe to pins A and F of the receptacle.	*d.* 25.5 volts on pins A and F.
			e. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 42–47.5 MCS. Connect the ME-26(*)/U DC probe to pins A and H of the receptacle.	*c.* 25.5 volts on pins A and H.
			f. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 47.5–53 MCS. Connect the ME-26(*)/U probe to pins A and J of the receptacle.	*f.* 25.5 volts on pins A and J.
			g. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 53–56 MCS. Connect the ME-26(*)/U DC probe to pins B and D of the receptacle.	*g.* 25.5 volts on pins B and D.
			h. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 56–60 MCS. Connect the ME-26(*)/U DC probe to pins B and E of the receptacle.	*h.* 25.5 volts on pins B and E.
			i. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 60–65. Connect the ME-26(*)/U DC probe to pins B and F of the receptacle.	*i.* 25.5 volts on pins B and F.
			j. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 65–70.5 MCS. Connect the ME-26(*)/U DC probe to pins B and H of the receptacle.	*j.* 25.5 volts on pins B and H.
			k. Set the AM-2060(*)/GRC ANT. FREQ. CONTROL to 70.5–76 MCS. Connect the ME-26(*)/U DC probe to pins B and J of the receptacle.	*k.* 25.5 volts on pins B and J.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
			l. Disconnect the test equipment and proceed to the audio amplifier tests (para 3-21).	*l.* None.

3-21. Audio Amplifier Gain and Frequency Response Tests

a. Test Equipment and Materials.

(1) Generator, Signal AN/URM-127.
(2) Voltmeter, Electronic ME-30(*)/U.
(3) Mounting MT-1029/VRC.
(4) Power Supply PP-2953(*)/U, or equal.
(5) Cable Assembly, Power, Electrical CX-4720/VRC.
(6) Receive dummy load assembly (para 3-3*e*, fig. 3-1).
(7) Resistor, carbon: 130 ohms ±10%, 5 watts.

b. Test Connections and Conditions. Remove the access plate from the top of the AM-2060(*)/GRC and connect the equipment as shown in figure 3-18. Turn on the equipment and allow it to warm up for 5 minutes before proceding.

c. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	*AN/URM-127* Tuning dial: 1,000 Hz OUTPUT CONTROL: maximum counterclockwise *ME-30(*)/U* Range switch: 10 volts	PWR switch: ON SPKR switch: OFF ANT. FREQ. CONTROL: any position	Adjust AN/URM-127 output level until ME-30(*)/U reads 7.80 volts.	AN/URM-127 shall not exceed 1.75 volts.
2	Same as step No. 1	Same as step No. 1	Maintain AN/URM-127 output level and adjust frequency from 300 to 3,000 Hz as follows; note ME-30(*)/U indication for each frequency: 1,000 Hz 300 Hz 2,500 Hz 3,000 Hz	ME-30(*)/U indications should be as follows: Same as obtained in step 1 above (reference level for succeeding db indications). ±1 db ±1 db ±3 db
3	Same as step No. 1	Same as step No. 1, except: SPKR switch: ON	*a.* Maintain AN/URM-127 output level and adjust the output frequency from 150 to 5,000 Hz. Observe the audio signal quality on the loudspeaker. *b.* At any frequency, set the AM-2060(*)/GRC SPKR switch to OFF.	*a.* There shall be no evidence of cone buzzing, rattling, or scraping in the sound from the loudspeaker. *b.* The sound from the loudspeaker shall stop.

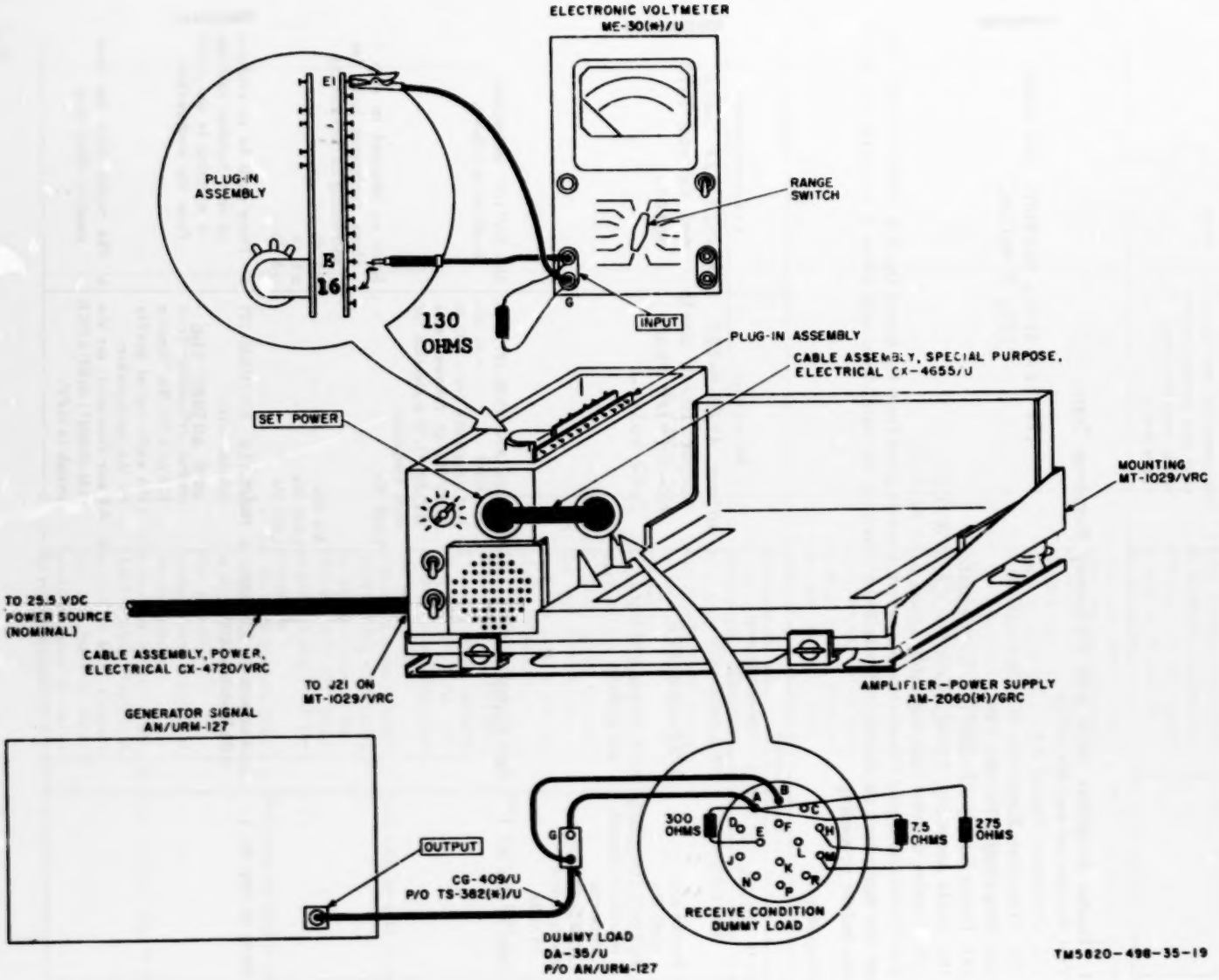


Figure 3-18. AM 2060(*)/GRC, test setup for amplifier gain and frequency response tests.

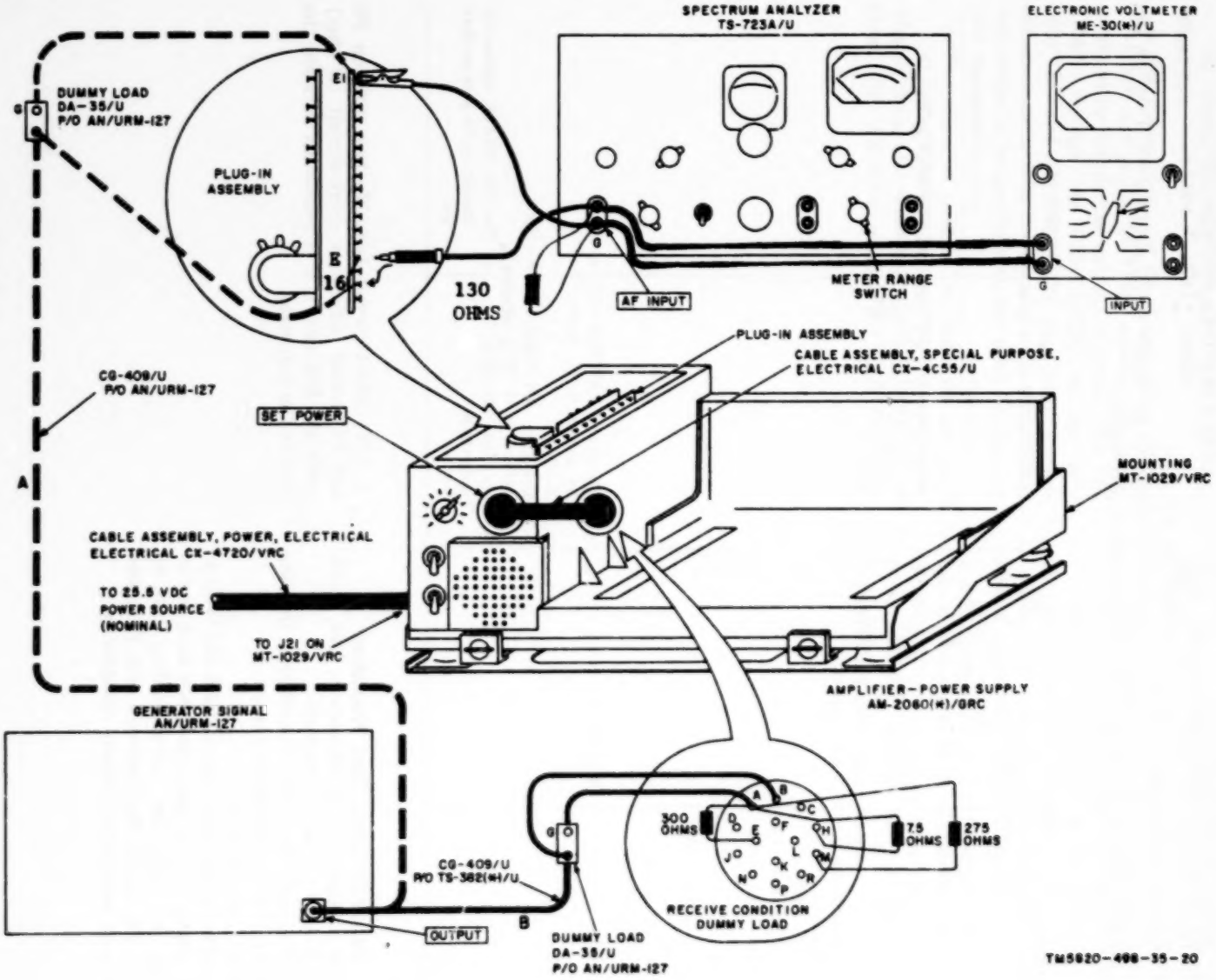


Figure 3-19. AM-2060(*)/GRC, test setup for audio amplifier distortion test.

3-22. Audio Amplifier Distortion Test

a. Test Equipment and Materials.

(1) Generator, Signal AN/URM-127.
(2) Spectrum Analyzer TS-723A/U.
(3) Mounting MT-1029/VRC.
(4) Power Supply PP-2953(*)/U, or equal.
(5) Receive dummy load assembly (para 3-3*e*, fig. 3-1).
(6) Voltmeter, Electronic ME-30(*)/U.
(7) Resistor, carbon: 130 ohms, ±10%, 5 watts.

b. Test Connections and Conditions. Connect the equipment as shown in A, figure 3-19. Turn on the equipment and allow it to warm up 5 minutes before proceeding.

c. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	*AN/URM-127* Tuning dial: 1,000 Hz Output level control: maximum counterclockwise *TS-723A/U* AF-RF switch: AF Meter range switch: 100% RANGE switch: X10 FREQ tuning dial: 100 Function switch: DISTORTION	PWR switch: ON SPKR switch: OFF ANT. FREQ. CONTROL: any position	a. Adjust the AN/URM-127 output level to 7.8 vac on ME-30(*)/U. b. The TS-723A/U indication should be no more than 1%.	a. None. b. None.
2	Same as step No. 1	Same as step No. 1	a. Connect the AN/URM-127 as shown in B, figure 3-19. b. Maintain AN/URM-127 output level (1a above). c. Note the TS-723A/U indication.	a. None. b. None. c. The TS 723A/U indication should not be greater than 8%.

3-23. CX-4655/GRC, Test Procedure

a. Test Equipment and Materials. Use Multimeter ME-26(*)/U as an ohmmeter.

b. Test Connections and Conditions. Use the ME-26(*)/U as instructed in *c* below.

c. Procedure (fig. 3-5).

(1) *Continuity test.* Use the ME-26(*)/U to test the continuity (O ohm) between each pin of connector P2 with the corresponding pin on connector P5, except that between pins F, L, and R there is no continuity (infinite resistance).

(2) *Short circuit test.* No two pins on P2 and P5 should indicate a short circuit (O ohm) when the ME-26(*)/U is connected between the pins on the connector.

3-23.1. Circuit Breaker Test of PWR Switch

a. Test Equipment and Materiels.

(1) Mounting MT-1029/VRC.

(2) Power Supply PP-1104/G.

(3) Cable Assembly, Power, Electrical CX-4020/VRC.

b. Test Connections and Conditions. Turn off the PP-1104/G and set its OUTPUT control fully counterclockwise (minimum output). Connect the PP-1104/G through the CX-4720/VRC to the MT-1029/VRC and AM-2060(*)/GRC (fig. 3-19). Remove the access plate from the top of the AM-2060(*)/GRC and connect a jumper between test point E5 (fig. 3-9) and the chassis.

c. Procedure.

(1) Adjust the PP-1104/G OUTPUT control clockwise until the D.C. AMPERE meter indicates 4 amperes. The AM-2060(*)/GRC PWR circuit breaker shall not have tripped.

(2) Continue to rotate the OUTPUT control clockwise until the D.C. AMPERE meter indicates 6 amperes. The AM-2060(*)/GRC PWR circuit breaker shall have tripped before 6 ampere indication is reached.

NOTE

The magnetic circuit breaker required up to 1 ampere beyond its Specification requirement because of its proximity to the loudspeaker magnet.

(3) Turn off the equipment and remove the jumper connection to test point E5.

3-24. Summary of Test Data

Personnel may find it convenient to arrange a checklist of the test performance standards given in paragraphs 3-19 through 3-32.1 similar to the one given below.

Tests	Performance standard	Indication obtained during test
1. CIRCUIT CONTINUITY AND RESISTANCE (para 3-18c):		
a. J2-C and J3-H	Continuity	
b. J2-C and J2-A	Open	
c. J2-J and J2-A	Continuity	
d. J2-D and J3N	22,000 ohms ±10 percent	
e. J2-D and J2-K	Open	
f. J3-T and J2-K	Continuity	
g. J3-T and J3-C	Open	
h. J2-H and J3-C	65 ohms ±10 percent	
i. J3-K and J3-S	5,600 ohms ±10 percent	
j. J3-A and J-2A	Continuity	
k. J3-A and J3-D	Open	
l. J3-A and J3-N	150 ohms ±10 percent	
m. J3-A and J4-C	Continuity	
2. OUTPUT VOLTAGES (para 3-20):		
a. At set POWER receptacle:		
(1) Pin E (receive condition)	+13 volts	
(2) Pin H (receive condition)	+2.6 ±0.3 volts	
(3) Pin M (receive condition)	+3 ±0.3 volts	
(4) Pin E (transmit condition)	+13 volts ±0.5	
(5) Pin H (transmit condition)	+2.6 ±0.3 volts	
(6) Pin M (transmit condition)	+3 ±0.3 volts	
b. At ANTENNA CONTROL receptacle:		
(1) Pins A, D, and N (30-33 MCS)	+25.5 volts	
(2) Pins A and E (33-37 MCS)	+25.5 volts	
(3) Pins A and F (37-42 MCS)	+25.5 volts	
(4) Pins A and H (42-47.5 MCS)	+25.5 volts	
(5) Pins A and J (47.5-53 MCS)	+25.5 volts	
(6) Pins B and D (53-56 MCS)	+25.5 volts	
(7) Pins B and E (56-60 MCS)	+25.5 volts	
(8) Pins B and F (60-65 MCS)	+25.5 volts	
(9) Pins B and H (65-70.5 MCS)	+25.5 volts	
(10) Pins B and J (70.5-76 MCS)	+25.5 volts	
3. AUDIO AMPLIFIER GAIN (para 3-21c, step 1)	1.75 vac max input at 7.80 vac output	
4. AUDIO AMPLIFIER FREQUENCY RESPONSE (para 3-21c):		
a. Frequency response (step 2):		
(1) 1,000 Hz	Reference	
(2) 300 Hz	±1 db	
(3) 2,500 Hz	±1 db	
(4) 3,000 Hz	±3 db	
b. Loudspeaker response (step 3)	No cone rattling, buzzing, or scraping	
5. AUDIO AMPLIFIER DISTORTION (para 3-22) :	8 percent maximum	
6. CX-4655/GRC (para 3-23):		
a. Continuity, each connector pin	0 ohm	
b. Short circuit, each connector pin	Infinite ohms	
7. PWR SWITCH CIRCUIT BREAKER (para 3-23.1)	0-4 amp: no 0-6 amp: yes	

CHAPTER 4
DEPOT OVERHAUL STANDARDS

4-1. Applicability of Depot Overhaul Standards

The tests on repaired equipment are designed to measure the performance capability of the equipment. Equipment that is returned to stock should meet the standards given in the tests.

NOTE

The depot overhaul test procedures (DOS) should not be used to test the performance of *new* equipment; that is, equipment that has not been repaired or rebuilt. Such equipment should be tested for conformance with the electrical and operational tests cited in the Military Specification under which the equipment was manufactured including all waivers and/or changes to the specification that were imposed upon or granted to the particular manufacturer of the equipment. For such information, address correspondence to: Commander, US Army Communications-Electronics Command, ATTN:DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

Following are production specifications applicable to the radio equipment covered in this manual:

1. Amplifier-Power Supply Group OA-3633(*)/GRC: Military Specification MIL-A-55147B(EL).
2. Antenna AS-1729/VRC: Military Specification MIL-A-55288B(EL).
3. Radio Set AN/PRC-25, Including Receiver-Transmitter, Radio RT-505/PRC-25: Military Specification MIL-R-55137C(EL).
4. Radio Set AN/PRC-77, Including Receiver-Transmitter, Radio RT-841/PRC-77: Military Specification, MIL-R-55499B(EL).

4-2. Applicable References

a. Repair Standards. Applicable procedures of depots performing tests and general standards for repaired electronic equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355-3 form a part of the requirements for testing the components of the radio sets covered by this manual.

b. Modification Work Orders. Perform all modification work orders (MWO's) applicable to the equipment before making tests specified. DA Pam 310-7 lists current MWO's.

4-3. Depot Overhaul Standards Procedures

Refer to the following publications for the depot overhaul standards for the indicated equipment which are part of Radio Sets AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160.

Component	*Publication*
Amplifier-Power Supply Group OA-3633(*)/GRC.	Paragraphs 3-18 through 3-24 of this publication.
Radio Set AN/PRC-25, including Receiver-Transmitter, Radio RT-505/PRC-25.	TM 11-5820-398-35.
Radio Set AN/PRC-77 including Receiver-Transmitter, Radio RT-841/PRC-77.	TM 11-5820-667-35.
Antenna AS-1729/VRC	TM 11-5985-262-15.

APPENDIX A
REFERENCES

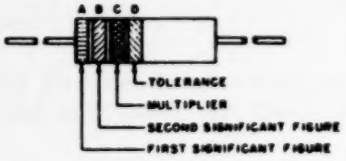
CTA 50-970	Expendable Items (Except: Medical, Class V, Repair Parts and Heraldic Items).
DA Pam 310-4	Index of Technical Publications.
SB 11-131	Vehicular Radio Sets and Authorized Installations.
TB SIG 355-1	Depot Inspection Standard for Repaired Signal Equipment.
TB SIG 355-2	Depot Inspection Standard for Refinishing Repaired Signal Equipment.
TB SIG 355-3	Depot Inspection Standard for Moisture and Fungus Resistance Treatment.
TM 11-5820-398-12	Operator's and organizational maintenance manual including repair parts and special tools lists: Radio set AN/PRC-25 (NSN 5820-00-857-0759) (including receiver-transmitter, radio, RT-505/PRC-25) (NSN 5820-00-857-0934) (Reprinted w/basic incl ch 1-5).
TM 11-5820-398-35	Field and depot maintenance manual: Radio set AN/PRC-25.
TM 11-5820-398-20P	Organizational maintenance repair parts and special tools lists: Radio set AN/PRC-25 (NSN 5820-00-857-0759).
TM 11-5820-398-34P	Direct support and general support maintenance repair parts and special tools lists (including depot maintenance repair parts and special tools lists: Radio set AN/PRC-25 (NSN 5820-00-857-0759).
TM 11-5820-401-10-1	Operator's manual: Radio sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-46 (NSN 5820-00-223-7433), AN/VRC-47 (NSN 5820-00-223-7434), AN/VRC-48 (NSN 5820-00-223-7435), and AN/VRC-49 (NSN 5820-00-223-7437) (used without an intercom system).
TM 11-5820-401-10-2	Operator's manual: Radio sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-46 (NSN 5820-00-223-7433), AN/VRC-47 (NSN 5820-00-223-7434), AN/VRC-48 (NSN 5820-00-223-7435), and AN/VRC-49 (NSN 5820-00-223-7437) (used with an intercom system).
TM 11-5820-401-12	Operator's and organizational manual (including repair parts and special tools lists): Radio sets AN/VRC-12 (NSN 5820-00-223-7412), NSN 5820-00-223-7415), AN/VRC-44 (NSN 5820-00-223-7417), AN/VRC-45 (NSN 5820-00-223-7418), AN/VRC-46 (NSN 5820-00-223-7433), AN/VRC-47 (NSN 5820-00-223-7434), AN/VRC-48 (NSN 5820-00-223-7437), AN/VRC-49 (NSN 5820-00-223-7437), AN/VRC-54 (NSN 5820-00-223-7567), and AN/VRC-55 (NSN 5820-00-402-2265); Mounts, MT-1029/VRC (NSN 5820-00-893-1323) and MT-1898/VRC (NSN 5820-00-893-1324); Antenna, AT-912/VRC (NSN 5820-00-897-6357); Control frequency selector C-2742/VRC (NSN 5820-00-892-3343), and Control, radio set C-2299/VRC (NSN 5820-00-892-3340) (Reprinted w/basic incl ch 1-3).
TM 11-5820-401-20P	Organizational maintenance repair parts and special tools lists: Radio sets AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (NSN 5820-00-223-7415), AN/VRC-44 (NSN 5820-00-223-7417), AN/VRC-45 (NSN 5820-00-223-7418), AN/VRC-46 (NSN 5820-00-223-7433), AN/VRC-47 (NSN 5820-00-223-7434), AN/VRC-48 (NSN 5820-00-223-7435), AN/VRC-49 (NSN 5820-00-223-7437), AN/VRC-54 (NSN 5820-00-223-7567), and AN/VRC-55 (NSN 5820-00-402-2265); Receiver-transmitter, radio, RT-246/VRC and RT-246A/VRC (NSN 5820-00-892-0623), RT-524/VRC and RT-524A/VRC (NSN 5820-00-892-0622); Receivers, radio R-442/VRC and R-442A/VRC (NSN 5820-00-892-0624); Mounts, MT-1029/VRC (NSN 5820-00-892-1323) and MT-1898/VRC (NSN 5820-00-893-1324); Control, frequency selector, C-2742/VRC (NSN 5820-00-892-3343), and Control, radio set, C-2299/VRC (NSN 5820-00-892-3340) (Navelex 0967-LP-432-3160).
TM 11-5820-401-30-4	Direct support maintenance manual (including repair parts and special tools lists): Amplifier, radio frequency AM-1780/VRC (NSN 5820-00-592-3342) (Navelex 0967-LP-432-3080) (Reprinted w/basic incl ch 1).

TM 11-5820-401-34-2	Direct support and general support maintenance manual: Radio sets, AN/VRC-12 (NSN 5820-00-223-7412), AN/VRC-43 (NSN 5820-00-223-7415), AN/VRC-44 (NSN 5820-00-223-7418), AN/VRC-46 (NSN 5820-00-223-7433), AN/VRC-47 (NSN 5820-00-223-7434), AN/VRC-48 (NSN 5820-00-223-7435), and AN/VRC-49 (NSN 5820-00-223-7437), and Receiver-transmitters, radio, RT-246/VRC and RT-246A/VRC (NSN 5820-00-892-0623), RT-524/VRC and RT-524A/VRC (NSN 5820-00-892-0622) (Navelex 0967-LP-432-3030) (Reprinted w/basic incl ch 1).
TM 11-5820-401-34-3	Direct support and general support maintenance manual: Radio sets, AN/VRC-12 (NSN 5820-00-23-7412), AN/VRC-43 (NSN 5820-00-223-7415), AN/VRC-44 (NSN 5820-00-223-7418), AN/VRC-46 (NSN 5820-00-223-7433), AN/VRC-47 (NSN 5820-00-223-7434), AN/VRC-48 (NSN 5820-00-223-7435), and AN/VRC-49 (NSN 5820-00-223-7437); and Receivers, radio R-442/VRC and R-442A/VRC (NSN 5820-00-892-0624) (Navelex 0967-LP-432-3060).
TM 11-5820-401-34P-2-1	Direct support and general support maintenance repair parts and special tools lists (including depot maintenance repair parts and special tools lists): Receiver-transmitters, radio RT-246/VRC and RT-246A/VRC (NSN 5820-00-892-0623).
TM 11-5820-401-34P-2-2	Direct support and general support maintenance repair parts and special tools lists (including depot maintenance repair parts and special tools lists): Receiver-transmitters, radio RT-524/VRC and RT-524A/VRC (NSN 5820-00-892-0622). R-442/VRC and R-442A/VRC (NSN 5820-00-892-0624).
TM 11-5820-401-35-1	Direct support, general support and depot maintenance manual (including repair parts and special tools lists): Control frequency selector C-2742/VRC, and Control, radio set C-2299/VRC (Navelex 0967-LP-432-3020) (Reprinted w/basic incl ch 1).
TM 11-5820-401-35-6	Direct support, general support and depot maintenance manual (including repair parts and special tools lists): Control, intercommunication set, C-2296/VRC (NSN 5820-00-892-3337) (Navelex 0967-LP-432-3100) (Reprinted w/basic incl ch 1).
TM 11-5820-401-35-7	Direct support, general support and depot maintenance manual (including repair parts and special tools lists): Control, Intercommunication set, C-2297/VRC (Navelex 0967-LP-432-3110) (Reprinted w/basic incl ch 1).
TM 11-5820-401-35-8	Direct support, general support and depot maintenance manual (including repair parts and special tools lists): Control, intercommunication set, C-2298/VRC (NSN 5820-00-892-3339) (Navelex 0967-LP-432-3120) (Reprinted w/basic incl ch 1).
TM 11-5820-401-35-9	Direct support, general support and depot maintenance manual (including repair parts and special tools lists): Mountings, MT-1029/VRC (NSN 5820-00-893-1323) and MT-1898/VRC (NSN 5820-00-893-1324) (Navelex 0967-LP-432-3131) (Reprinted w/basic incl ch 1).
TM 11-5820-497-20P	Organizational maintenance repair parts and special tools lists for Receiver-Transmitter, Radio RT-505/PRC-25 (NSN 5820-00-857-0934).
TM 11-5820-497-34P	Direct support and general support maintenance repair parts and special tools lists (including depot maintenance repair parts and special tools lists): Receiver-transmitter, radio, RT-505/PRC-25 (NSN 5820-00-857-0934).
TM 11-5820-498-12	Operator's and organizational maintenance manual: Radio sets AN/VRC-53 (NSN 5820-00-223-7467), AN/VRC-64 (NSN 5820-00-223-7475), AN/GRC-125 (NSN 5820-00-223-7411), and AN/GRC-160 (NSN 5820-00-223-7473), and Amplifier power supply group OA-3633/GRC.
TM 11-5820-498-20P	Organizational maintenance repair parts and special tools lists: Radio sets, AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160, and Amplifier power supply groups, OA-3633/GRC and OA-3633A/GRC (parts list for OA-3633/GRC and OA-3633A/GRC, NSN 5820-00-973-3383, only).

TM 11-5820-498-34P	Direct support and general support maintenance repair parts and special tools lists (including depot maintenance repair parts and special tools lists): Radio sets, AN/VRC-53, AN/VRC-64, AN/GRC-125, and AN/GRC-160, and Amplifier power supply groups OA-3633/GRC and OA-3633A/GRC (parts list for OA-3633/GRC and OA-3633A/GRC, NSN 5820-00-973-3383, only).
TM 11-5820-667-12	Operator's and organizational maintenance manual including repair parts list: Radio set AN/PRC-77 (NSN 5820-00-930-3724) (Including Receiver-transmitter, radio, RT-841/PRC-77) (NSN 5820-00-930-3725) (Reprinted w/basic incl ch 1-7).
TM 11-5820-667-20P	Organizational maintenance repair parts and special tools lists: Radio set, AN/PRC-77 (NSN 5820-00-930-3724).
TM 11-5820-667-34P	Direct support and general support maintenance repair parts and special tools lists (including depot maintenance repair parts and special tools lists): Radio set, AN/PRC-77 (NSN 5820-00-930-3724).
TM 11-5820-667-35	Direct support, general support and depot maintenance manual: Radio set AN/PRC-77 (Reprinted w/basic incl ch 1).
TM 11-5985-262-15	Operator's organizational, direct support, general support and depot maintenance manual including repair parts and special tools lists: Antenna, AS-1729/VRC (NSN 5820-00-985-9024) (Reprinted w/basic incl ch 1-6).
TM 11-5950-212-15	Operator's, organizational, direct support, general support and depot maintenance manual including repair parts and special tools lists: Variable power transformer TF-523/U (NSN 5950-00-926-0742).
TM 11-5965-257-15	Organizational, direct support, general support and depot maintenance manual including repair parts and special tools lists: Handsets, H-138/U and H-138A/U (FSN 5965-892-0972).
TM 11-5965-262-13	Organizational and direct support maintenance manual including repair parts and special tools lists: Headset-microphone H-161/U and H-161A/U (FSN 5965-082-0437 and 5965-824-4871) (Reprinted w/basic incl ch 1-2).
TM 11-5965-280-15	Operator's, organizational, direct support, general support and depot maintenance manual including repair parts and special tools lists: Handset H-189/GR (NSN 5965-00-069-8886).
TM 11-5965-282-15	Operator's, organizational, direct support, general support and depot maintenance. manual including repair parts and special tools lists: Headset-microphone kit MK-1039/G (Reprinted w/basic incl ch 1-2).
TM 11-6625-200-15	Operator's, organizational, direct support, general support and depot maintenance manual: Multimeters ME-26A/U (NSN 6625-00-360-2493), ME-26B/U, ME-26C/U (NSN 6625-00-646-9409), ME-26D/U (NSN 6625-00-913-9781).
TM 11-6625-255-14	Operator's, organizational, direct support, and general support maintenance manual: Spectrum analyzers TS-723A/U, TS-723B/U, TS-723C/U, and TS-723D/U (NSN 6625-00-668-9418).
TM 11-6625-320-12	Operator's and organizational maintenance manual: Voltmeter, meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.
TM 11-6625-514-12	Operator's and organizational maintenance manual: Test sets, electronic circuit plug-in units AN/GRM-55, AN/GRM-55A, AN/GRM-55B, and AN/GRM-55C.
TM 11-6625-683-15	Operator's, organizational, direct support, general support and depot maintenance manual: Signal generator AN/URM-127 (NSN 6625-00-783-5965).
TM 38-750	The Army Maintenance Management System (TAMMS).

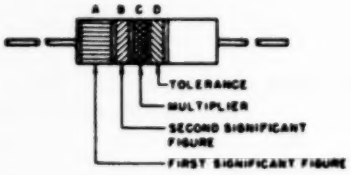
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

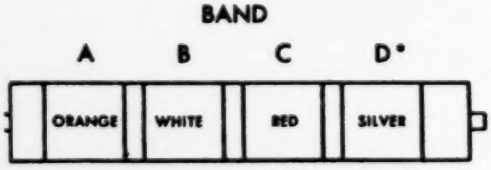


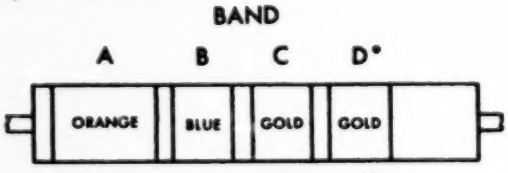
BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING





NOMINAL RESISTANCE 3,900 Ohms 3.6 Ohms

RESISTANCE TOLERANCE ± 10 percent ± 5 percent

STD-R2

*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

Figure 4-1. Color code markings for MIL-STD resistors.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-51, Direct and General Support requirements for following equipments: AN/GRC-125, AN/VRC-53 and OA-3633/GRC.

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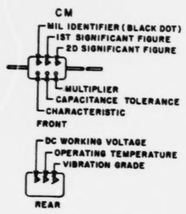
Charts Transposed to

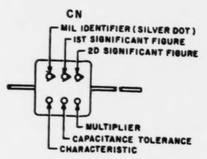
End of Volume.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

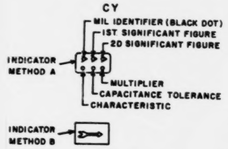
GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



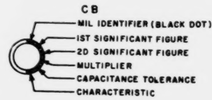
MICA-DIELECTRIC



PAPER-DIELECTRIC

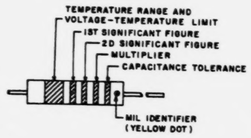


GLASS-DIELECTRIC, GLASS CASE

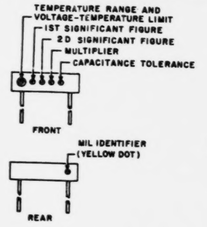


MICA, BUTTON TYPE

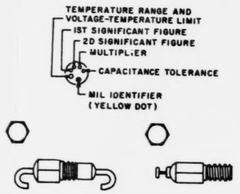
GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



AXIAL LEAD

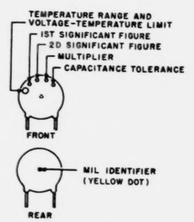


RADIAL LEAD



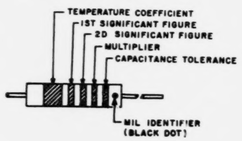
FEED-THROUGH

STAND-OFF

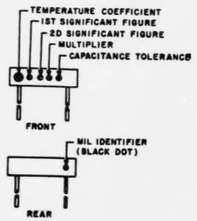


DISK-TYPE

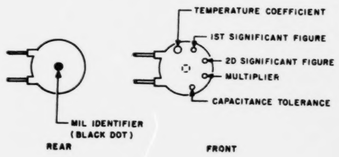
GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC



AXIAL LEAD



RADIAL LEAD



DISK-TYPE

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL-C-5, MIL-C-91, MIL-C-11272, and MIL-C-10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL-C-11015.
4. Temperature coefficient in parts per million per degree centigrade.

STD-CZ

Figure 4-2. Color code markings for MIL-STD capacitors.

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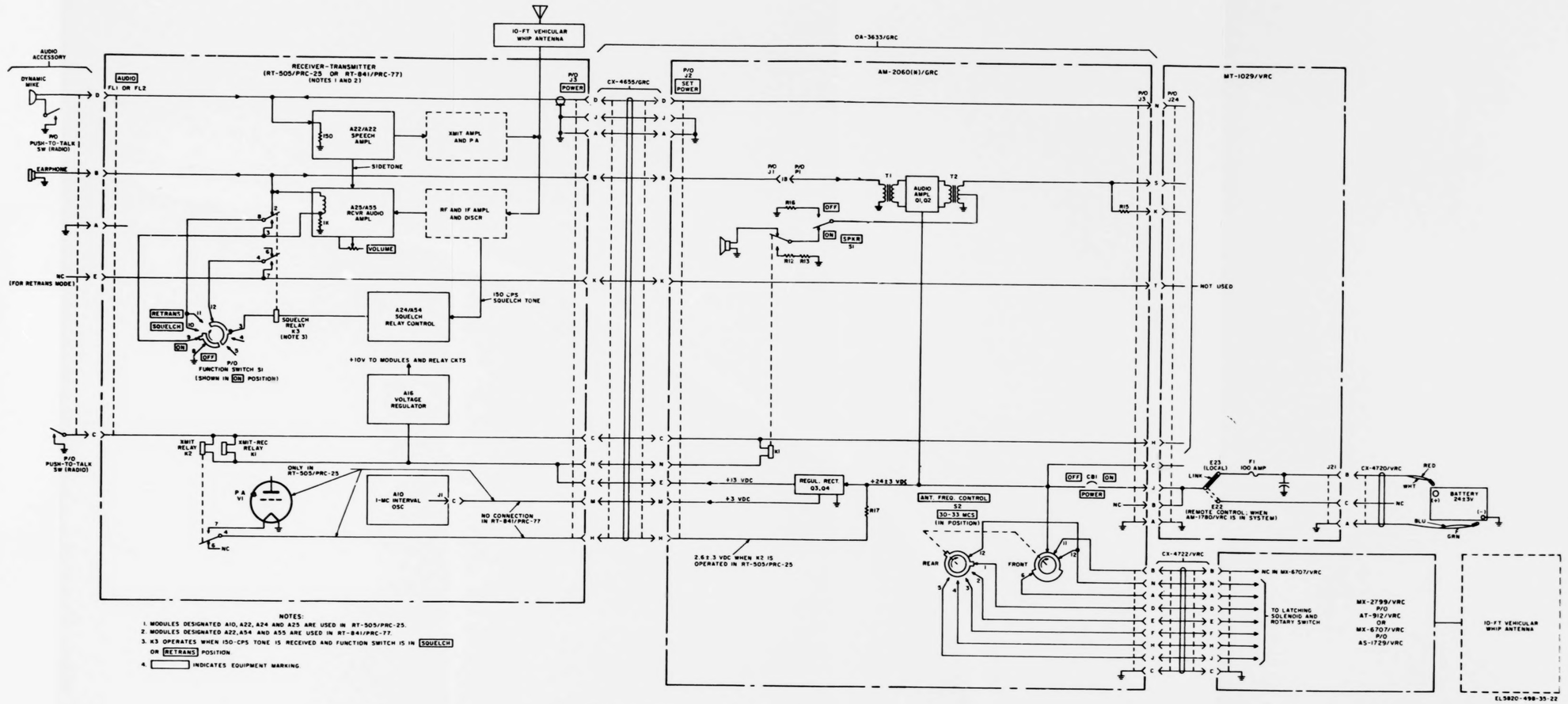

NOTES:

1. MODULES DESIGNATED A10, A22, A24 AND A25 ARE USED IN RT-505/PRC-25.
2. MODULES DESIGNATED A22, A54 AND A55 ARE USED IN RT-841/PRC-77.
3. K3 OPERATES WHEN 150-CPS TONE IS RECEIVED AND FUNCTION SWITCH IS IN SQUELCH OR RETRANS POSITION.
4. [ ] INDICATES EQUIPMENT MARKING.

Figure 4-3. System power and signal distribution, without crewmember control boxes.

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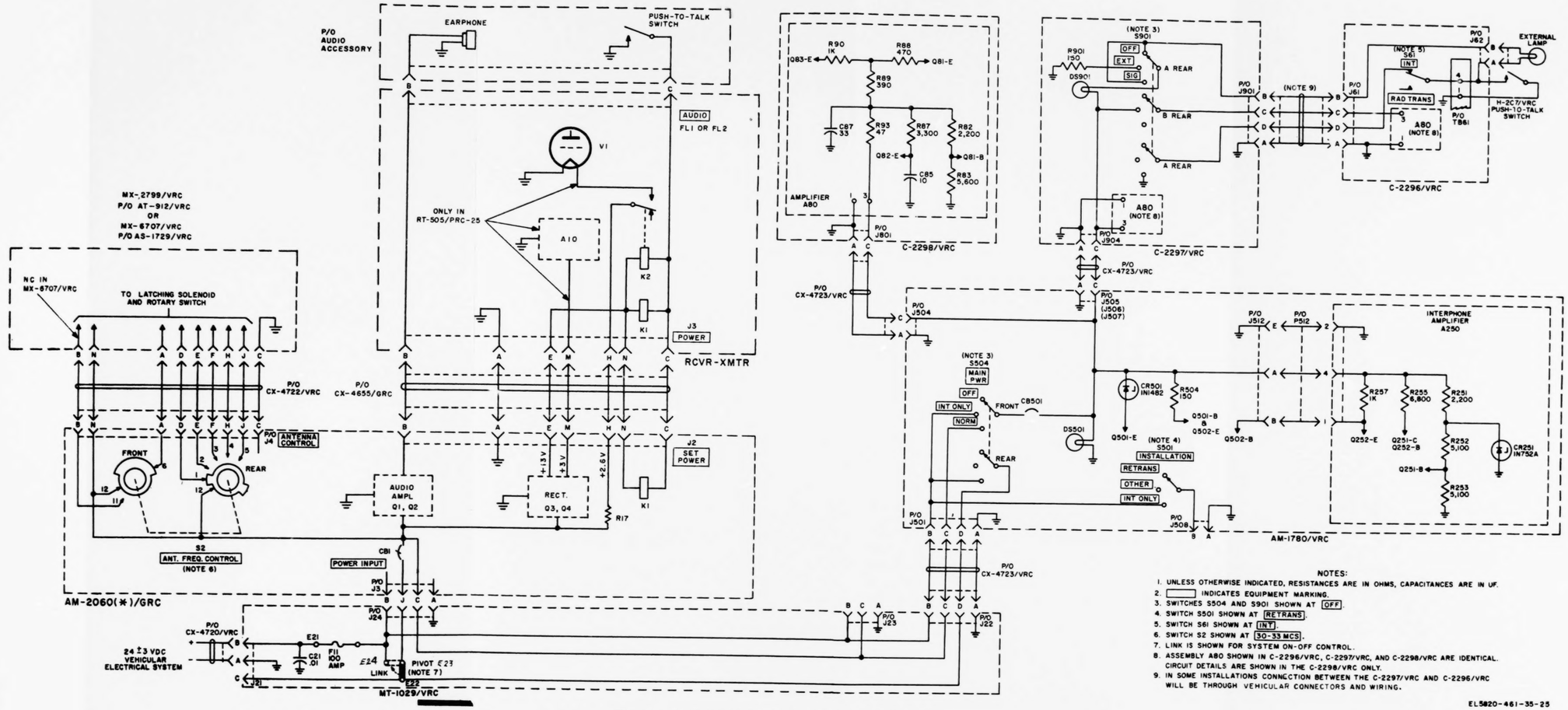

NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF.
2. [ ] INDICATES EQUIPMENT MARKING.
3. SWITCHES S504 AND S901 SHOWN AT [OFF].
4. SWITCH S501 SHOWN AT [RETRANS].
5. SWITCH S61 SHOWN AT [INT].
6. SWITCH S2 SHOWN AT [30-33 MCS].
7. LINK IS SHOWN FOR SYSTEM ON-OFF CONTROL.
8. ASSEMBLY A80 SHOWN IN C-2296/VRC, C-2297/VRC, AND C-2298/VRC ARE IDENTICAL. CIRCUIT DETAILS ARE SHOWN IN THE C-2298/VRC ONLY.
9. IN SOME INSTALLATIONS CONNECTION BETWEEN THE C-2297/VRC AND C-2296/VRC WILL BE THROUGH VEHICULAR CONNECTORS AND WIRING.

EL5820-461-35-25

Figure 4-4. System power distribution, including crewmember control boxes.

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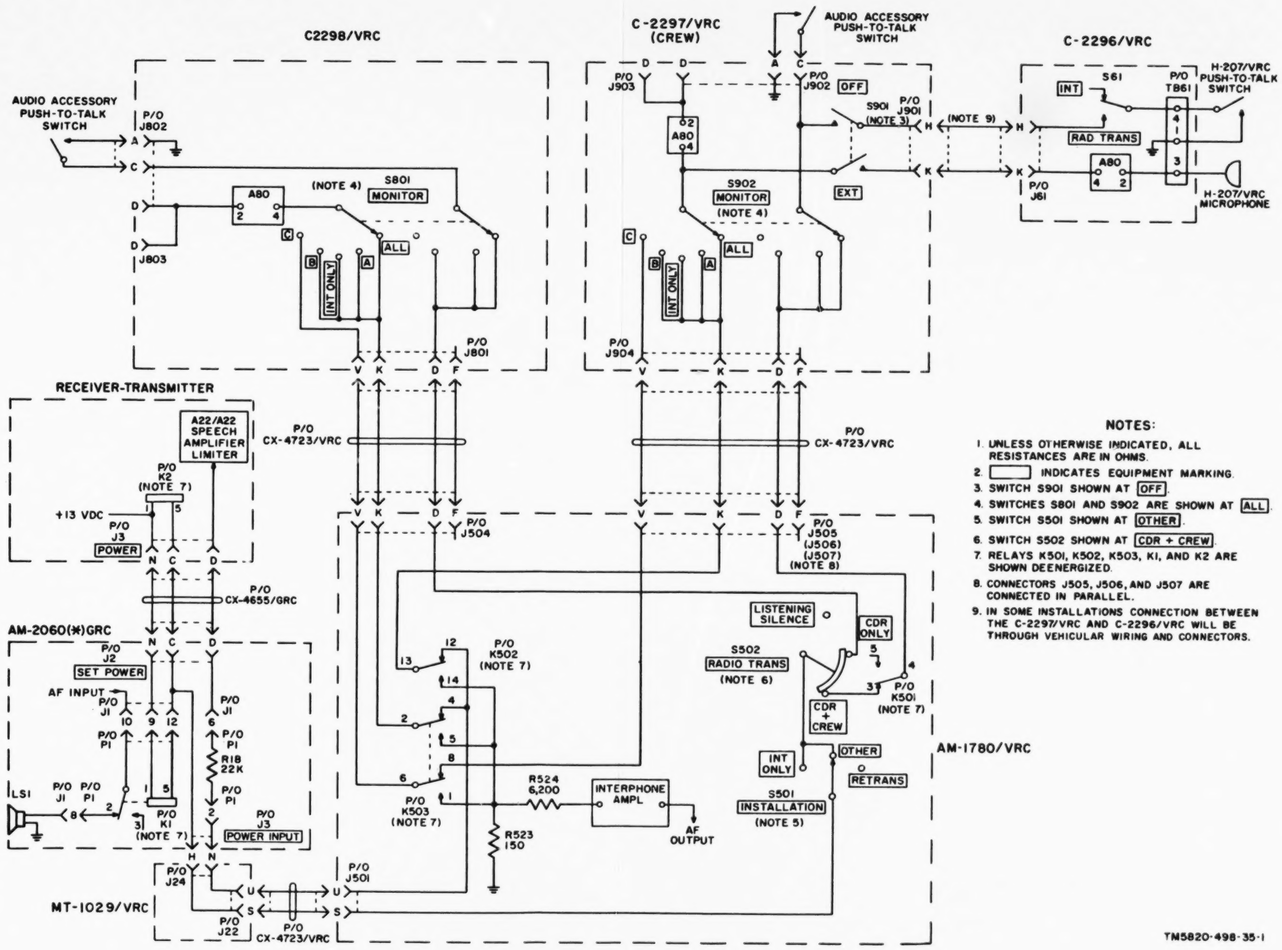

NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCES ARE IN OHMS.
2. [ ] INDICATES EQUIPMENT MARKING.
3. SWITCH S901 SHOWN AT OFF.
4. SWITCHES S801 AND S902 ARE SHOWN AT ALL.
5. SWITCH S501 SHOWN AT OTHER.
6. SWITCH S502 SHOWN AT CDR + CREW.
7. RELAYS K501, K502, K503, K1, AND K2 ARE SHOWN DEENERGIZED.
8. CONNECTORS J505, J506, AND J507 ARE CONNECTED IN PARALLEL.
9. IN SOME INSTALLATIONS CONNECTION BETWEEN THE C-2297/VRC AND C-2296/VRC WILL BE THROUGH VEHICULAR WIRING AND CONNECTORS.

TM5820-498-35-1

Figure 4-5. Receiver-transmitter control of radio transmission, and microphone signal distribution, including crewmember control boxes.

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NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS.
2. [ ] INDICATES EQUIPMENT MARKING.
3. SWITCHES S1, S503, AND S901 SHOWN AT [OFF].
4. SWITCH S501 SHOWN AT [RETRANS].
5. SWITCHES S801 AND S902 SHOWN AT [ALL].
6. RELAYS K1, K501, AND K502 SHOWN DEENERGIZED.
7. IN SOME INSTALLATIONS, CONNECTION BETWEEN THE C-2297/VRC AND C-2296/VRC WILL BE THROUGH VEHICULAR WIRING AND CONNECTORS.

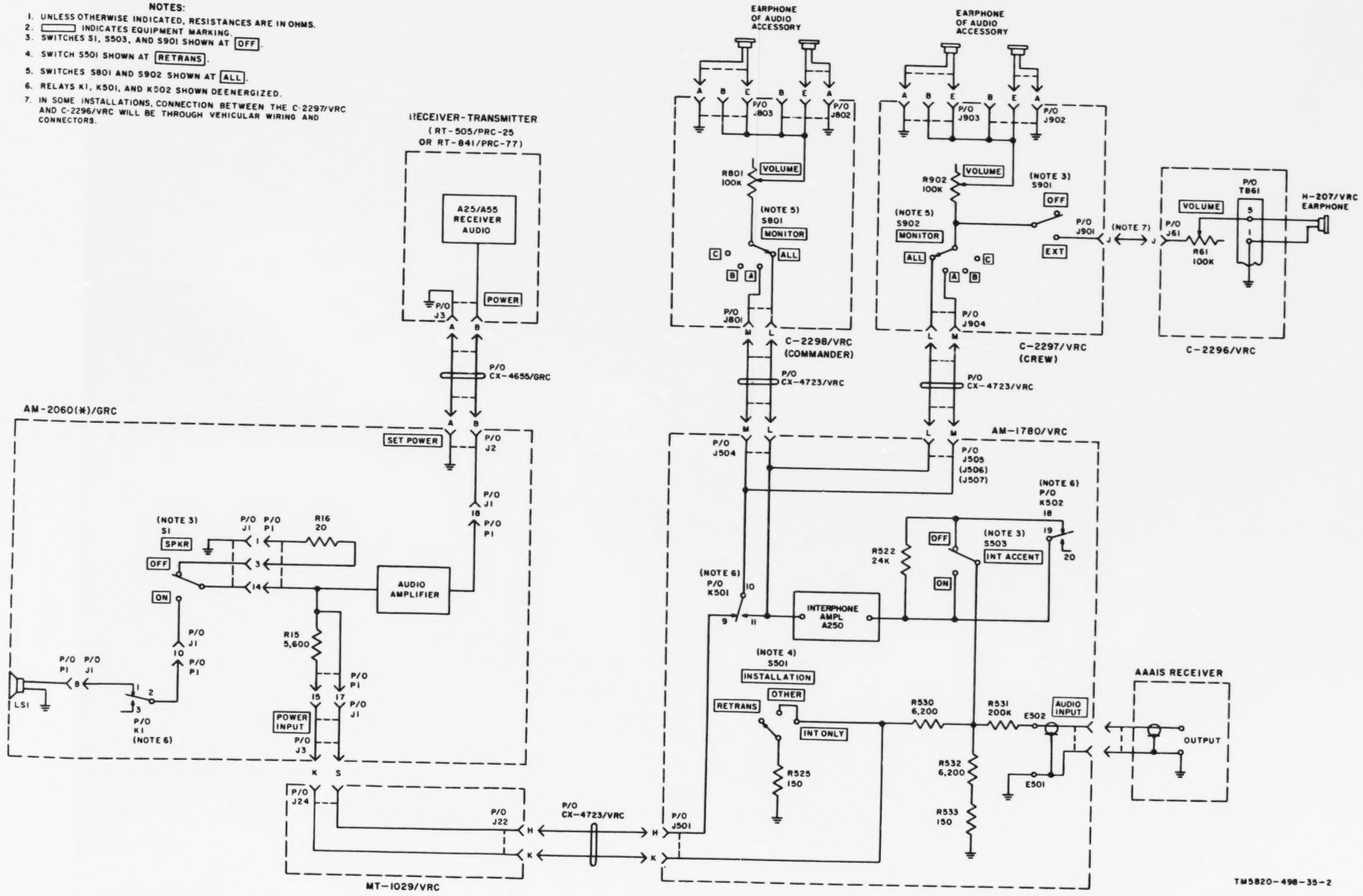

Figure 4-6. Receiver-transmitter received audio signal distribution including crewmember control boxes.

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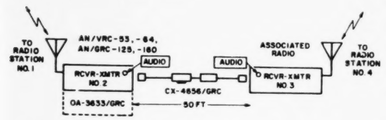
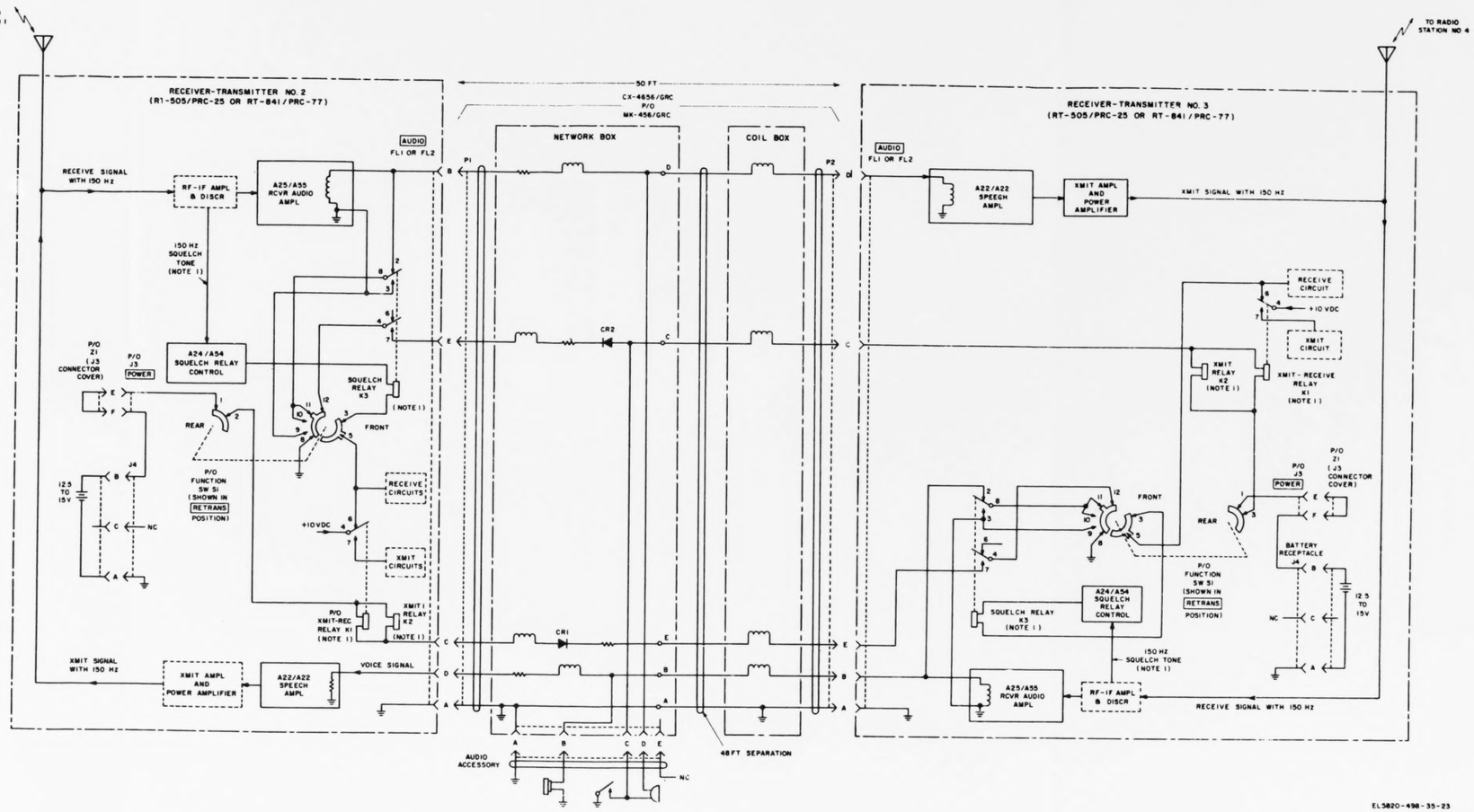
NOTES:

1. K3 OPERATES WHEN 150 HZ SQUELCH SIGNAL IS RECEIVED FROM THE AIR. IN TURN, GROUND (FROM A25/A35) IS PROVIDED THROUGH K3 AND THROUGH THE OTHER RADIO'S K2 AND K1 WINDING TO BATTERY.
2. MODULES DESIGNATED A10, A22, A24, AND A25 ARE USED IN RT-505/PRC-25.
3. MODULES DESIGNATED A22, A40, A54, AND A55 ARE USED IN RT-841/PRC-77.
4. ▭ INDICATES EQUIPMENT MARKING.
5. RETRANSMISSION SITE SETUP.





EL5820-498-35-23

Figure 4-7. Retransmission circuits using RT-505/PRC-25 and RT-841/PRC-77.

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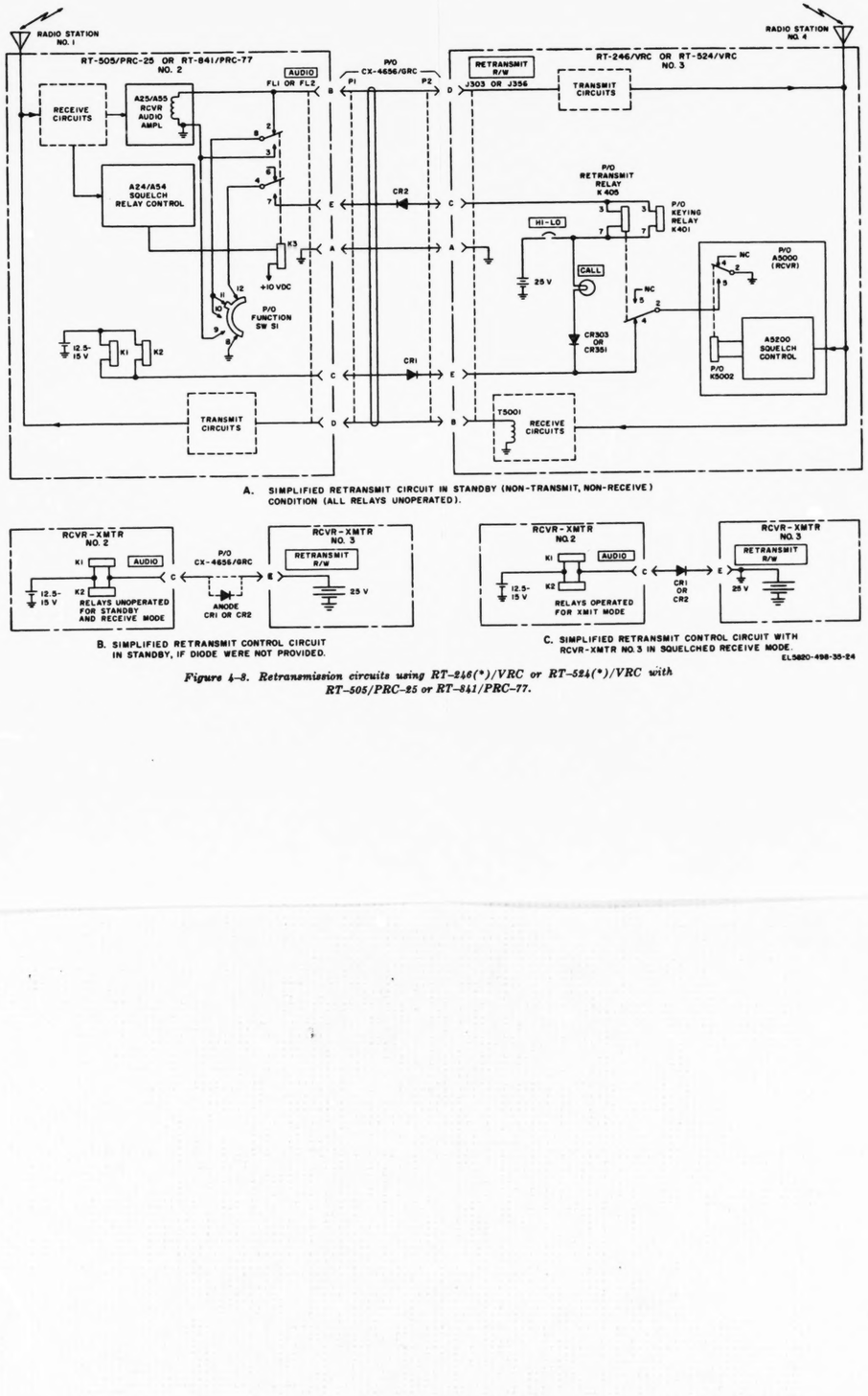

A. SIMPLIFIED RETRANSMIT CIRCUIT IN STANDBY (NON-TRANSMIT, NON-RECEIVE) CONDITION (ALL RELAYS UNOPERATED).

B. SIMPLIFIED RETRANSMIT CONTROL CIRCUIT IN STANDBY, IF DIODE WERE NOT PROVIDED.

C. SIMPLIFIED RETRANSMIT CONTROL CIRCUIT WITH RCVR-XMTR NO. 3 IN SQUELCHED RECEIVE MODE.

EL5820-498-35-24

Figure 4-8. Retransmission circuits using RT-246(*)/VRC or RT-524(*)/VRC with RT-505/PRC-25 or RT-841/PRC-77.

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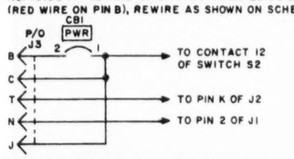
NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. WAFER SWITCH (S2) IS VIEWED FROM KNOB END AND IS SHOWN IN EXTREME CCW POSITION.
3. ▭ INDICATES EQUIPMENT MARKING.
4. RECEPTACLE VIEWED FROM PIN OR RECEPTACLE SIDE.
5. ANT. FREQ. CONTROL SWITCH S2 (REAR)

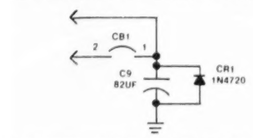
POSITION	PANEL MARKING	CONTACTS USED
1	30–33 MCS	1–12
2	33–37 MCS	2–12
3	37–42 MCS	3–12
4	42–47.5 MCS	4–12
5	47.5–53 MCS	5–12
6	53–56 MCS	1–12
7	56–60 MCS	2–12
8	60–65 MCS	3–12
9	65–70.5 MCS	4–12
10	70.5–76 MCS	5–12

ON SWITCH S2 (FRONT), CONTACTS 6 AND 12 ARE USED IN POSITIONS 1 THROUGH 5 AND CONTACTS 11 AND 12 ARE USED IN POSITIONS 6 THROUGH 10.

6. VOLTAGE MEASUREMENTS TAKEN WITH RCVR-XMTR DISCONNECTED FROM AM-2060(*)/GRC.
7. J2 CIRCUITS THRU CX-4655/GRC TO RECEIVER-TRANSMITTER.
8. J3 CIRCUITS TO MT-1029/VRC FOR CONNECTION TO VEHICULAR BATTERY AND ASSOCIATED INTERCOM EQUIPMENT (AM-1780/VRC, ETC).
9. J4 CIRCUITS THRU CX-4722/VRC TO MX-2799/VRC (AT-912/VRC) OR MX-6707/VRC (AS-1729/VRC).
10. FOLLOWING INCORRECT CIRCUIT CONNECTION AT J3 PROVIDED ON EQUIPMENT PROVIDED ON ORDERS NO. 15108-PP-62 AND 5175-PP-64. IF WIRED AS BELOW (RED WIRE ON PIN B), REWIRE AS SHOWN ON SCHEMATIC.



11. CB AND C9 PROVIDED IN AM-2060A/GRC ONLY.
12. ON CONTRACT DAAB07-79-C-0068 CAPACITOR C8 REMOVED AND DIODE CR1 IS INSTALLED AS FOLLOWS:



13. ON CONTRACT DAAB07-79-C-0068 RESISTOR R6 CHANGED FROM 270 OHMS to 220 OHMS.

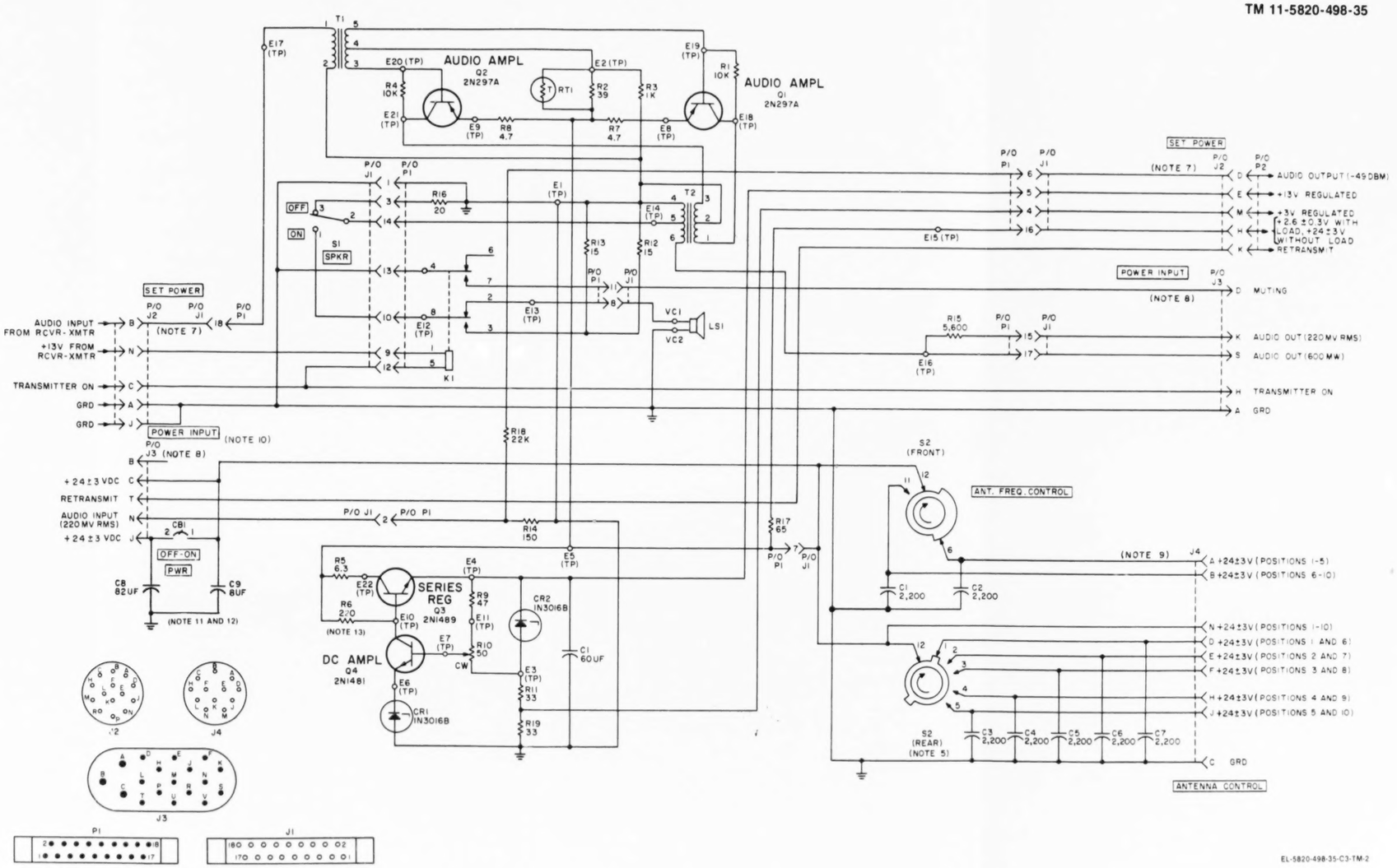


Figure 4-9. AM-2060(*)/GRC, schematic diagram.

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